Price Transparency in the Health Care Sector

by

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Abstract

This dissertation consists of three essays on price and insurance coverage transparency in the health care market. In these essays, I empirically examine how providing patients with information about health care prices and insurance coverage characteristics affects both the utilization and prices of health care and then, in turn, affects the physician's decision to disseminate this information. To this end, I study the consequences of a specific Medicare document that Part B physicians use to warn patients about expected out-of-pocket costs prior to receipt of medical care.

In the first chapter, "The Effect of Health Care Price Transparency on Utilization and Prices", I exploit a March 2008 reform to the Medicare document that required providers to provide additional charge price information to patients *at the time of service* to estimate the effects of price transparency on utilization and prices themselves. I argue that this reform affected certain providers and not others and use this insight to implement a difference-in-differences empirical strategy with Medicare administrative claims data. I find that, for preventive gynecological procedures, this type of price information given directly to patients reduces the number of claims submitted to Medicare for reimbursement and reduces the prices providers charge. These results uncover a potential downside of increased price information that should be considered along with the previously established benefit of incentivizing patients to switch to low-cost providers. Price transparency has the potential to reduce utilization of medical care, and, depending on the value of the medical care that is reduced, the welfare consequences are unclear.

In the second chapter, "Information Disclosure in the Presence of General Uncertainty: Evidence from Medicare Part B", I document surprising patterns of physician use of the Medicare document. The strategies can be explained by the presence of general uncertainty over the accuracy of the information and the optimal response of the distributor to the demand consequences of making an ex-post "mistake". I show that a substantial number of physicians make ex-post mistakes when giving this document; they do not give this document to patients who experience an ex-post non-coverage and vice versa. In March 2008, the informational content of the document was changed in such a way that shifted the demand consequences of ex-post mistakes differently across physicians. I show that the response of physician strategies are consistent with the presence of high costs in discerning which patients will be denied. Using Medicare claims data from before and after this reform, I find that physicians restrain their distribution strategies accordingly, but the probability of making an ex-post mistake remains unchanged. These results imply that the presence of general uncertainty plays a nontrivial role in explaining physician disclosure behavior, and that physicians strategically respond to the demand consequences of revealing price information to patients.

In the third and final chapter, "The Effect of Insurance Coverage Information on Utilization of Health Care for New Medicare Enrollees ", I investigate the association between receipt of salient Medicare coverage information soon after enrollment on future utilization of medical care. In particular, I use the Medicare document to examine the effect of being warned within the first six months of enrollment that Medicare does not cover all procedures on total charges and procedure counts in the subsequent two years. The results indicate

that this warning is associated with fewer submitted charges and fewer procedures performed. For immediate policy relevance, the results suggest that early patient experience with new health care plans can be important in determining future health care spending. However, I find suggestive evidence that vulnerable groups, the poor and less-educated, refrain from receiving covered care in addition to non-covered care after receipt of this information, arguably due to the high cost of disentangling the two. This indicates that the information can be effective in reducing spending, but this benefit is mitigated by reductions in necessary care by disadvantaged populations.

Primary Reader: Jorge Balat

Secondary Readers: Robert A. Moffitt and Richard Spady

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Chapter 1

The Effect of Health Care Price Transparency on Utilization and Prices

1.1 Introduction

The study of uncertainty is important for understanding health behavior and the response of that behavior to many proposed reforms of the health insurance environment in the United States. Starting with Arrow's 1963 discussion of the uncertainties that plague the health care sector, much research has demonstrated that individuals do not perceive attributes of their care correctly. While research has traditionally focused on the uncertainties regarding the prevalence of illness and the efficacy of treatment, focus has shifted toward the *financial uncertainties* that surround medical care decision-making and have been thought to contribute to the high costs of health care.

Price uncertainty in particular is now receiving attention. For example, a recent white paper from the Brookings Institution (Hall et al., 2016) proposes methods for "solving surprise medical bills". Patients typically first learn prices

when they receive an explanation of benefits from their insurer which can arrive months after a medical visit (Reinhardt, 2006) and after the patient is already locked into payment. Policymakers, private firms, and insurers have taken note of this, along with documented price dispersion (Phelps, 2000), and have identified an opportunity for reducing health care spending by reducing price uncertainty. The hope is that equipping patients with price information prior to receipt of medical care will help patients become selective consumers and drive down the costs of health care.

While the idea of increased price information, or *price transparency*, before receipt of medical care is appealing, the implementation is not straightforward. Pricing systems in health care are complex. There are potentially multiple prices associated with a single procedure, for example: the charge price, which is the price the provider would charge an uninsured individual;[1] the negotiated or allowed price, which is the price the insurer and provider have agreed upon;[2] and the out-of-pocket expense, which is the amount for which the patient is responsible in consideration of deductibles, coinsurance, and copays. What results is a system where provider identity, insurer identity, insurance plan characteristics, and procedures codes are all potentially necessary for determining price. Taken together, these complications make it unclear which prices to report (Sinaiko and Rosenthal, 2011), by whom the information should be given, and how it should be given.

The existing literature on price uncertainty reflects this complexity. Across

[1] It is possible that the provider might have cash discounts, charitable reductions, or negotiations with the uninsured.

[2] A discussion of the negotiations between providers and insurers can be found in Gaynor, Ho, and Town (2015).

this literature there is variation in the type of price information that is studied. There are papers that study information given about charge prices (Christensen, Floyd, and Maffett, 2017), negotiated prices (Tu and Lauer, 2009) and out-of-pocket expenses (Lieber, 2017 and Whaley et al., 2014). While the papers agree that there is potential for substantial reductions in spending, there is spread in the actual estimated effects ranging from no effect to upwards of 17% savings. The commonality among these papers is that the price information is typically given via a website. Mehrotra, Brannen, and Sinaiko (2014) have established that use of these price information websites by patients is quite low and concentrated for specific procedures. Their findings might explain the variation in effects sizes across papers.

An unstudied alternative for delivering the information to patients is to give it in a manner similar to other markets, namely, to give the information directly to patients *at the time of service*. In this paper, I fill this gap. I exploit a 2008 Medicare reform that required providers to provide additional price information to patients, and I use detailed claims data to estimate the effects of this reform. Researchers have not previously exploited this reform, although it provides an excellent source of variation in information sets. The particular Medicare reform applies to Medicare Part B providers and extends previous information disclosure requirements. Medicare has always urged Part B providers to notify patients when they think that a procedure will not be paid by Medicare, in order to warn the patient that they will be financially responsible for the procedure in that case. The incentive to abide by this request is that if the provider does not notify the patient, then the provider cannot collect payment from the patient if the procedure is not covered. This notification is achieved by

having the patient read and sign a standardized document called the Advance Beneficiary Notice of Noncoverage (ABN). After receipt of this document, the patient has the opportunity to decline the medical procedure. If the patient decides to have the medical procedure performed, she does so acknowledging that she will be financially responsible in the event of noncoverage. The 2008 reform changed the informational content of the ABN. Prior to the reform, the providers do not have to include the prices that would be charged in the event of noncoverage on the ABN. After the reform, there is a dedicated spot on the ABN where providers are required to write the prices that would be charged in the event of noncoverage. This reform represents an increase in the price information that patients have prior to receiving medical care and can be used to study the effects of increased price transparency.

I develop a model of medical decision-making under price uncertainty to guide the empirical work. The main innovation of the model is to explicitly incorporate uncertainty over the probability of denial, and the price in the event of denial. These uncertainties are (partially) resolved by information given at the provider's discretion. In the model, the provider knows that the price information they give to the patient will influence the patient's decision to undergo the procedure. As such, the decision to give information is endogenous. In the model, the decision to give information is binary; the provider either gives information or they do not. Before the 2008 reform if the provider chooses to give information, they must reveal information about the chance of denial but not information about the price in the event of denial. After the reform, if the provider chooses to give information, they must reveal both information about the chance of denial *and* reveal the price in the event of denial. Comparison of

the model solutions before and after the reform yield predictions of the effect of the reform. The main theoretical prediction of the model is that patients who are uncertain about prices are less (more) likely to undergo the procedure after being shown high (low) prices, relative to the average price. What occurs when the patient is shown the average price depends on their degree of risk aversion and whether they have properly specified prior beliefs about the distribution of the prices.

The data used in this analysis are the 2007 through 2009 5% research identifiable administrative claims files provided by the Centers for Medicare and Medicaid Services (CMS). The data provide detailed claim information for 5% of Medicare beneficiaries, including date of claim, provider identity, provider location, procedure codes, diagnosis codes, charge amounts, allowed amounts, and procedure modifier codes. The procedure modifier code is the critical variable for this analysis since there is a specific value which indicates that the patient was given the ABN. Preventive gynecological procedures lend themselves to this research due to the prevalence of the ABN modifier among these procedures.

To estimate the effects of the reform I employ a difference-in-differences strategy. Since the reform is national and occurred at one time, to implement the difference-in-differences approach I exploit variation in the providers' pre-reform use of the ABN to separately identify providers that presumably should be affected by the reform from providers that presumably should not be affected, and I assign the two types to the treatment and control groups, respectively. Both pre- and post-reform, many providers *never* use the ABN and many providers *always* give the ABN to every patient. The providers who always distribute the notification serve as the treatment group and providers

who never use the notification serve as the control group. The idea is that patients visiting providers that do not distribute the ABN are not affected by the increase in price information since they will not see the document in the first place, and patients visiting providers who always distribute the ABN are affected by the increase in price information. The restriction of the empirical strategy to providers who do not use the ABN with discretion alleviates the endogeneity concern of selective dissemination raised in the theoretical work.

The results show that revealing price information at the time of service reduces the number of claims submitted by 7.3% on average and reduces charge prices by 3.4% on average. In line with the model predictions, I find that the effects are more pronounced for high-price providers; utilization at high-price providers falls by 13.3% on average. To test the model prediction that the effects are more pronounced for relatively uninformed beneficiaries, I test if the effect sizes differ for providers who service new-to-Medicare beneficiaries. I find that the number of claims submitted falls by 12.3% at providers who service new-to-Medicare beneficiaries. The results are robust to the inclusion of varying fixed effects and varying criteria for providers to be included in the analysis and in the treatment group.

The results thus indicate that both prices and utilization fall when prices are revealed. If the goal of policy is to reduce health care spending, these results do suggest how to improve price transparency initiatives to make them more effective in this regard. The results imply that price information which targets price elastic procedures, discloses prices directly to patients, and explains why the information is relevant is effective in reducing health care spending. Future

price transparency initiatives in the health care sector should try to incorporate these features. Given the short time frame of the dataset, it is difficult to draw conclusions about long term health outcomes. Without better information about outcomes, it is difficult to determine if patients are cutting back on necessary or unnecessary medical care. Although it is difficult to concretely state the welfare consequences of this information, the finding that the information reduces the utilization of medical care highlights a potential downside to increased price information.

The remainder of the paper proceeds as follows. Section 2 discusses the existing literature, section 3 discusses the Medicare reform, section 4 presents the theoretical framework, section 5 discusses the data, section 6 discusses the empirical strategy and presents initial results, section 7 presents heterogeneity in the effects sizes, and section 8 concludes with a discussion of policy implications and future research.

1.2 Existing Literature

This research contributes to the large literature regarding uncertainties in health care. The prevalence of uncertainty in health care markets is well-established. Traditionally research focused on the uncertainties surrounding the delivery of medical care itself. Starting with Arrow's 1963, academic research has furthered our understanding of the uncertainty in the chance of illness and recovery, the efficacy of treatment (see Coscelli and Shum, 2004; Crawford and Shum, 2005), and provider quality (see Hibbard, Stockard, and Tusler, 2005; Cutler, Huckman, and Landrum, 2004; Dafny and Dranove, 2008; Dranove et al., 2003).

More recently, focus has shifted to the uncertainties surrounding the financial aspects of medical care decision-making. There is a substantive literature studying the frictions and uncertainties that affect insurance plan choice (see Chernew, Gowrisankaran, and Scanlon, 2008; Handel and Kolstad, 2015; Abaluck and Gruber, 2011; Kling et al., 2012; Ketcham et al., 2012; Fang, Keane, and Silverman, 2008; Barseghyan et al., 2013).

Recently, there exist a few papers that specifically study the effects of price transparency in health care, and there is variation in the findings. These papers typically fall into one of two groups. The first group contains papers that make use of sweeping state reforms to identify the effects of price transparency on prices and price dispersion. The typical state reform requires hospitals to post the charge prices or average prices paid for their most common procedures. These postings are most commonly found on websites and sometimes are contained in booklets onsite. Christensen, Floyd, and Maffett (2017) use states that implemented policies to disclose charge prices online and find that prices charged fell by 7.3% on average for hip replacements and less than 1% (indistinguishable from zero) for appendectomies. Tu and Lauer (2009) focus on a price transparency initiative in New Hampshire which provides median price estimates on a HealthCost website for about thirty common health services. They find no evidence of effects.

The second group of papers make use of data from private companies who are employed by firms to provide insurance plan-specific price transparency to employees. These companies offer a website where beneficiaries can receive price information at different providers that is specific to their insurance plan. The information is created using historical claims for beneficiaries on the same plan.

Lieber (2017) makes use of data from Compass Professional Health Services and finds that using the website reduces prices paid by 10% - 17% but consumers only shop for less than 20% of their care. Whaley et al. (2014) use data from Castlight Health and find that using the website is associated with about 13% reductions in prices paid for laboratory tests and advanced imaging. They find that using the website is only associated with about a 1% decrease in prices paid for clinician office visits.

As discussed in section 1, the important way in which my analysis differs from these papers is that I make use of information that is given directly to patients, and receipt of the information is acknowledged by the patients.[3] In the literature discussed here, the patient must choose to seek out the price information, typically through a website, in order to obtain it. As such, the economic mechanism most pertinent to the existing strand of research is search and the associated costs. The data I use arise from a regulation that requires price information to be given directly to the patient by the provider at the time of service. This allows me to estimate the effects of a type of price transparency that has gone unstudied by the previous literature.

1.3 Medicare Reform

To obtain estimates of the effects of price information that is given directly to patients, I exploit a price information regulation pertaining to Medicare Part B beneficiaries. This reform serves as plausibly exogenous variation in patients' information sets.

[3]Robinson and Brown (2013) study a reference pricing initiative that mailed price information to beneficiaries. That natural experiment included both an increase in price transparency and a simultaneous change in benefit design.

Medicare is the United States' federal insurance program for the elderly. Medicare Part A provides coverage for inpatient procedures and services while Medicare Part B provides coverage for outpatient and non-institutional procedures and services. Price information is relevant to Medicare beneficiaries because there are provisions of cost-sharing in Part B. Furthermore if Medicare denies a claim, the provider may seek their entire charge amount from the beneficiary, not just the Medicare allowed amount which is essentially fixed across providers.

Medicare Part B rules require providers to inform patients when they think a claim will be denied by Medicare.[4] Notification must be given to the patient by the provider prior to performing the procedure. This notification is achieved by having the patient read and sign a standardized form called the Advance Beneficiary Notice of Noncoverage (ABN). The timing of this information is key. The information is given directly to the patient before they make their medical decision. This gives the beneficiary a chance to decide if they want the procedure performed with better information about the financial liability prior to making their decision. The information does not itself guarantee denial. It simply conveys to the patient that the provider believes that Medicare will deny the claim. The actual denial outcome is decided by the Medicare claims processors who do not take into consideration whether the patient received this notification.

[4]Reasons for believing a procedure might be denied are that the beneficiary has met the frequency limits for the procedure or the circumstances under which the procedure is performed do not meet the Medicare standard for medical necessity as determined by Local and National Coverage Determinations. For example, a patient might not have the proper diagnosis, as exhibited by the ICD-9 diagnosis code, that Medicare would expect to see for medical necessity.

Both pre-reform and post-reform the incentive the provider has to use the form is that, in the event of a denial, if there is not an ABN on file, the provider may not seek reimbursement from the patient. In this sense, use of the form is not mandatory. If the provider chooses not to use the form, they forgo revenue, but they are allowed to make that choice. If the procedure is denied by Medicare and there is an ABN on file, the provider is not restricted to charging the Medicare allowed amount. They may charge the patient their charge price, which can be significantly higher than the Medicare allowed amount.

Prior to 2008, providers did not have to reveal the price that they would charge in the event of denial on the ABN. In March 2008, the Centers for Medicare and Medicaid Services (CMS) announced that (accurate) *prices* must be included on the ABN. This reform is an increase in price transparency and thus the effect of this reform is interpreted as the effect of price transparency.

Figures 1.1 and 1.2 show the forms before and after the reform. The updated form was released when the announcement was made, and mandatory use of the new form occurred in March 2009. Between the announcement and the implementation either form was acceptable, and after the implementation, only the new form was acceptable notification of expected denial. We can see that after the reform, there is a dedicated spot for the estimated cost that must be pre-populated before the form is given to the patient. Thus prior to the reform, beneficiaries who receive the information are only informed about the chance of denial and not prices before making treatment decisions. On the 2002 ABN there is a spot that allows the patient to write down an estimate of the cost provided by the doctor. However, prior to the reform there is no requirement that this estimate be populated nor accurate. After the reform, the prices had

to be pre-populated and be accurate within 25% of the actual amount. After the reform, patients are still informed about the chance of denial and are seeing prices in advance of treatment. They are also given the option to not submit the claim to Medicare and to pay the charge price upfront. Although in the data we cannot say definitively whether patients are choosing this option or forgoing care it is more likely they are forgoing care since the option to not bill Medicare is a weakly dominated strategy by Option 1. Furthermore, by picking Option 2 the patient forfeits their right to appeal, making this option even less desirable.

I will focus solely on estimating the effects of the reform to the informational content of the form, but this simple form serves many functions that might pique the interest of researchers. It transfers financial liability from the provider to the patient, it puts the burden of determining the necessity of medical care on the patient,[5] and it provides information to the patient that they might not otherwise have had. In the data and empirical sections we will see variation in use of this form that will raise questions about its other functions. In the other chapters of this dissertation, I explore what more we can learn about the provider/patient relationship using this Medicare regulation.

1.4 Theoretical Framework

In this section I derive predictions of how the increase in price information on the ABN affects patients and providers using a theoretical model of medical decision-making. These predictions serve to focus the empirical work. I model how patients (section 1.4.1) and providers (section 1.4.2) make decisions under the presence of price uncertainty. In section 1.4.3, I explain how the reform

[5]Shomaker and Link (2014) present an interesting discussion on the bioethics of this form.

affects the components of the model and use comparative statics to arrive at the predictions. The first prediction is that the reform causes patients who are uncertain about prices to be less likely to receive medical care after being shown high prices and are more likely to receive care after being shown low prices. The second prediction highlights an endogeneity concern that must be addressed in the empirical work. Specifically, the second prediction is that providers foresee the effect of the reform on patients and adjust their decision to reveal prices accordingly. Thus in the empirical strategy I propose a method for isolating the effect of the information conditional on the provider not changing their information dissemination decision.

Although the model is specific to the ABN, the innovation is that it explicitly incorporates uncertainty in the out-of-pocket expense that is (partially) resolved by the informational content of the ABN. The model is sequential, but it is not dynamic. This model starts with a beneficiary at the doctor's office who is considering a specific medical procedure. I begin at this point because this is where the information provided on the ABN is the most relevant.[6] At this point the provider acts first by deciding to give the beneficiary the ABN, and then the beneficiary acts by deciding to have the medical procedure performed or not.

1.4.1 Beneficiary Utility

We have beneficiary i at provider p considering a medical procedure. Their choice variable is whether to have the procedure performed $M_i \in \{0, 1\}$. Their ex-post utility from having the medical procedure performed is conditional on

[6] I abstract away from modeling what brought them to this point, including why they chose that doctor, with what information they are equipped, and who suggested the procedure.

whether the provider gives the patient the ABN form, $F_i \in \{0, 1\}$:

$$u_{ip}(M_i = 1|F_i) = v_i - F_i D_i f(C_p) \tag{1.1}$$

The payoff of not having the procedure performed is $u_{ip}(M_i = 0) = 0$. The first term v_i captures the beneficiary's benefit from receiving the medical procedure. This term varies across beneficiaries and is unobserved by the provider. The second term $F_i D_i f(C_p)$ captures the monetary cost the beneficiary has to pay for the service. This term indicates that the beneficiary only pays, and knows they only pay, in the event of denial, $D_i = 1$, and if they receive the form, $F_i = 1$.[7] In this case they must pay the provider's charge price, C_p. For simplicity I assume away the cost sharing payments if the claim is accepted by Medicare, $D_i = 0$. I make this decision because in the empirical analysis I focus on procedures with low Medicare allowed prices so any cost sharing will be minimal compared to the full charge prices. The function $f(.)$ is intended to capture the risk preference of the beneficiary. The shape of this function is important in predicting the effect of the reform.

The beneficiary is not certain about the denial outcome, D_i, and the charge price, C_p.[8] Their expectations of these terms are affected by the information they receive on the form and are expressed by $E[D_i|F_i]$ and $E[f(C_p)|F_i]$, respectively. After the provider gives (or withholds) the form, the beneficiary compares the expected utility of having the procedure done to the utility of not having the procedure done. Assuming that D_i and $f(C_p)$ are independent

[7] As per the Medicare rules regarding the ABN form discussed in section **??**

[8] I do not explicitly model the formation of the variation in prices, I take it as given. For literature substantiating the existence of price variation within a market, see Stigler (1961), Diamond (1971), Burdett and Judd (1983), Hong and Shum (2006), Hortaçsu and Syverson (2004), Sorensen (2001), and Tappata (2009).

conditional on F_i then the beneficiary will choose M_i as follows:

$$M_i = \begin{cases} 1 \text{ if } v_i > F_i E[D_i|F_i]E[f(C_p)|F_i] \\ 0 \text{ otherwise} \end{cases} \tag{1.2}$$

This yields a cutoff point for v_i above which beneficiaries will have the procedure done. Denoting the distribution of v_i by $G(.)$ and assuming $v_i \in \mathbb{R}_+$, the probability a patient will have the procedure done is:

$$P(M_i = 1|F_i) = 1 - F_i G(E[D_i|F_i]E[f(C_p)|F_i]) \tag{1.3}$$

1.4.2 Provider Payoff

The provider knows the beneficiary's choice function along with the function $f(.)$ and chooses F_i so as to maximize expected payoff. The ex-post payoff the provider receives is:

$$\Pi(F_i) = M_i((1 - D_i)MA + D_i F_i C_p) - \alpha F_i + \xi M_i(1 - D_i) - cM_i \tag{1.4}$$

The first terms captures the revenue collected by the provider. They only receive payment if the beneficiary has the procedure done, $M_i = 1$. The provider knows that the beneficiary's decision is dependent on whether the providers gives the form. The payment amount is dependent on the denial outcome. If the claim is accepted, $D_i = 0$, then the provider collects the Medicare allowed amount, MA. If the claim is denied, $D_i = 1$, the provider collects their charge price, C_p, only if they gave the form, $F_i = 1$. The second term, $-\alpha F_i$, captures the direct cost of distributing the form.[9] This cost is incurred if you give the form, regardless of whether the patient has the procedure done. The term, $\xi M_i(1-D_i)$, captures the

[9]According to physicians, one of the the largest direct costs associated with giving the form is time.

non-monetary payoff the provider receives from performing medical procedures. This is intended to capture the altruistic concerns of the provider.[10] Specifically, this term indicates that a provider receives added benefit from a beneficiary who gets a procedure done that is accepted by Medicare. This accepted by Medicare condition is intended to capture that a provider gains non-monetary value by performing medically necessary procedures. The final term $-cM_i$ is intended to capture the provider's cost of performing the procedure.

Note that if the provider could perfectly observe D_i then there would be no reason to give the form to beneficiaries for whom $D_i = 0$. Giving the form, the provider would incur the marginal cost and increase the chance that the person chooses not receive care, potentially forgoing the revenue and the non-monetary payoff. I do not assume that providers observe the denial outcome perfectly. Along with potential uncertainty over the denial outcome, providers are also uncertain about whether the beneficiary will choose to receive care if they give the form. The provider will give the form according to the following rule:

$$F_i = \begin{cases} 1 \text{ if } E[\Pi(1)] > E[\Pi(0)] \\ 0 \text{ otherwise} \end{cases} \tag{1.5}$$

Where:

$$E[\Pi(1)] = E[(M_i((1 - D_i)MA + D_iC_p) - c + \xi M_i(1 - D_i))|F_i = 1] \tag{1.6}$$

$$E[\Pi(0)] = E[(1 - D_i)MA + \xi(1 - D_i)] \tag{1.7}$$

The provider's decision to give the form is dependent on their expectation of denial for the beneficiary and how the information affects the beneficiary's

[10] discussed in Arrow (1963)

probability of seeking care. The main takeaway from this exercise is that the beneficiaries who receive the form are not random. They are selected by the provider exactly based on how they are expected to respond. Thus estimating how patients respond to the form using cross-sectional observational data is not trivial. One methodology would be to find a valid instrument for the cost of distributing the form, c. To circumvent this concern, I choose not to estimate the effect of the form itself, instead I choose to estimate the effect of the increase in price information contained on the form. The theoretical implications of this change to the form are discussed in the follow subsection.

1.4.3 The Price Information Reform

Before the reform, the ABN does not give full information about the charge price, and after the reform, the ABN reveals the charge price with certainty. This affects the expectation of the financial liability terms in the beneficiary's utility. Prior to the reform, conditional on receiving information, the beneficiary will have the procedure done according to the following rule:

$$M_i = \begin{cases} 1 \text{ if } v_i > F_i E[D_i|F_i] E[f(C_p)|F_i] \\ 0 \text{ otherwise} \end{cases} \tag{1.8}$$

After the reform, the beneficiary will have the procedure done if:

$$M_i = \begin{cases} 1 \text{ if } v_i > F_i E[D_i|F_i] f(C_p) \\ 0 \text{ otherwise} \end{cases} \tag{1.9}$$

The predictions of the model are as follows. Comparing Equation 1.8 to Equation 1.9 we see that if $f(C_p) > E[f(C_p)|F_i = 1]$ then the probability a beneficiary chooses to receive medical care after seeing the ABN falls and vice versa. What happens when the beneficiary observes the mean price depends

on the properties of $f(.)$. In the case of risk neutrality, and properly specified beliefs, the beneficiary's decision will be unchanged upon viewing the mean price. A simple application of Jensen's inequality tells us that in the case where $f(.)$ is concave (convex) the beneficiary will be less (more) likely to have the procedure performed given that they have properly specified beliefs about the distribution of C_p. Although, we cannot be certain about the shape of $f(.)$, if we simply assume that it is monotonically increasing then we can safely say that if the price revealed is above a certain threshold, the probability the patient has the procedure done falls and for prices below a certain threshold the probability rises.

From the provider's perspective, the reform affects the expected profit of giving the form, and it only affects this profit through M_i. If $M_i(1)$ falls in response to the reform then the expected profit of giving the form now falls relative to before the reform, making it less likely that the provider will distribute the form. If $M_i(1)$ rises in response to the reform then the expected profit of giving the form now rises relative to before the reform, making it more likely that the provider will distribute the form. Thus, to estimate the change in the probability a patient has the procedure conditional on receiving the form empirically is not straightforward. This change contributes to the provider's payoff so it will also cause providers to adjust their information dissemination which in turn affects the probability a patient has the procedure.

This model was designed to exhibit how patients would respond to the information on the form and how physicians might in turn choose to use the form. It is a simplified model and does not take into account external factors that would influence the setting of the charge price. However it is useful to think through

how the optimal charge price would be affected by the mechanisms in this example. Notice the charge price, C_p, only enters the physician's profit if they use the document, or $F_i = 1$. So let us consider maximizing $E[\Pi(1)]$, equation 1.6, to think about the optimal charge price. The benefit to increasing the charge price is a direct increase in what the physician collects. The potential downside is deterring the patient and not receiving the payout. Prior to the reform this model actually includes no downward pressure on the charge price since the patient is only working off of their own beliefs to decide whether to have the procedure done or not, not the charge price. Let's just assume that prior to the reform, the charge price is set based on external factors. After the reform, the physician must reveal their charge price to the patient, and the price they reveal does have the possibility of deterring (or enticing) the patient. All else equal, we would expect that after the reform, physicians with high prices would be likely to reduce their charge prices to combat the deterrence effect,[11] and it is possible that physicians with low prices might actually raise their charge prices.

There are limitations of the model. They include 1) not explicitly modeling the choice of provider, 2) not modeling quality uncertainty that may be (partially) resolved by price information, 3) not explicitly modeling dynamic considerations of both the provider and beneficiary, and 4) not endogenously determining how a beneficiary becomes informed. This first limitation is mitigated by recent work indicating that when beneficiaries are moved to higher

[11] This is similar to what Christensen, Floyd, and Maffett (2017) hypothesize to explain their findings that physicians lower charge prices in response to increased charge price transparency. They proffer the explanation that providers do not want to be viewed as "expensive". The model presented here explains why that might be the case. It is precisely because patients incorporate the probability of paying that charge price into their decision-making process.

cost sharing plans, they refrain from health care altogether instead of shopping around. This is true even when the beneficiaries are equipped with a price finding website (Brot-Goldberg et al., 2017). All these limitations would be most pressing if the model were specified with structural estimation as the purpose. However, the purpose here is to present a framework which highlights and predicts the effects of information dissemination at the doctor's office and informs the regression equations. For this purpose, conditional on consistency with the empirical facts, simplicity and clarity of the model is desired over complexity included for realism. Where the model lacks in complexity of external and dynamic considerations, it succeeds in explicitly including the individual components of the out-of-pocket expense and the uncertainty surrounding these terms.

1.5 Data

I use Medicare administrative claims data to estimate the effects of the reform to the ABN. Specifically, I use the 5% CMS research identifiable claims and enrollment files for years 2007 through 2009. These data contain enrollment, residence, and basic demographic information for 5% of the Medicare population, which is approximately 2.5 million beneficiaries. For each of the beneficiaries, the data contain detailed information for each claim submitted to Medicare including provider identifiers, provider location down to the nine digit zip code, provider characteristics, health care common procedure codes (HCPCS), procedure modifier code, diagnosis codes (ICD-9), submitted charges, allowed charges, and Medicare payments.

The crucial variable in this analysis is the procedure modifier code. The value "GA" for this variable indicates that the patient was given the ABN form. In this dataset, there are approximately 270 million procedures submitted to Medicare by non-institutional medical providers over the three years. Of these 270 million, approximately 1.5 million have the modifier GA. In order to detect the effect of the reform, it is necessary to narrow the dataset to the procedures for which the ABN is actually used. I narrow the procedures on which I focus by looking at the prevalence of this modifier by procedure code. Section 1.5.1 provides a discussion of the procedures selected for this research.

After narrowing the set of procedures, in section 1.5.2 I examine the prevalence of the procedure modifier code across providers to expose variation in use of the ABN across providers that serves as the foundation for the empirical strategy which is formally discussed in section 1.6.

1.5.1 Selection and Discussion of Procedures

To narrow the procedures on which I focus, I look at ABN form use by procedure. Table 1.1 depicts for which procedures the ABN is most used.[12] Specifically, it presents the top fifteen procedures ranked by percentage with the GA modifier in descending order. We see that the modifier accompanies a large percentage of certain procedures. It is used commonly for preventive gynecological and preventive men's health procedures, for chiropractic procedures, and for laboratory tests. In the preferred analysis, I will focus on procedure code "G0101".[13]

Procedure code "G0101" refers to screening pelvic examinations. They are

[12] Using a 10% random sample of the data to lessen the computational burden

[13] "G0101" and "Q0091" are typically performed together, so study of claims with the "G0101" procedure code captures much of the utilization of "Q0091"

preventive procedures for asymptomatic women to check for any abnormalities. They are subject to frequency limitations. Specifically, they are covered once every two years for low-risk women and once every year for high-risk women. More frequent visits are considered to be medically unnecessary by Medicare coverage determinations. In the event that the procedure is covered, beneficiaries are required to pay any portion of the Medicare allowed amount that falls under their annual deductible of $150 and 20% of the allowed amount that falls above the deductible.

A few reasons make this procedure code relevant for studying the effects of the ABN. First we see that the denial rates are quite high for this procedure. This makes the information on the ABN quite relevant for patients who receive this procedure. These high denial rates are explained by a large portion of beneficiaries receiving this procedure more frequently than biannually. Of the 71,385 beneficiaries that have the procedure done in 2007, 31.6% have the procedure done in 2008, and 17.5% have these procedures done in both 2008 and 2009. There is substantial persistence in the choice of provider. Of the patients who have more than one visit, 85.8% visit the same provider on all occasions.

One might think that there is little uncertainty over the chance of denial for this procedure given how well-defined the coverage is and since this is a repeated procedure, any uncertainty will be resolved quickly over time. Figure 1.3 presents the denial rates by age. We see that there is high volatility in the denials before the rates stabilize. This is consistent with the idea that young beneficiaries are more uncertain about the coverage rules than their older counterparts. Table 1.2 depicts the age distribution of the procedures. We see that about 42% of the procedures come from beneficiaries who are 70 or younger

and are still arguably learning the rules of coverage and hence will be affected by the information contained on the ABN.

Table 1.3 presents summary statistics for this procedure over the three years of data. It is a relatively low priced procedure. Medicare only reimburses about $34 for this procedure when covered. However, the variation in the charge prices is large with the mean being about $67 across all three years. The 99th percentile is about $200 which is more than six times the first percentile. It is denied about 30% of the time. This high denial and variation in charge prices makes the information given on the ABN quite relevant to beneficiaries getting this procedure done.

1.5.2 Variation in Form Use by Providers

Here I discuss variation in form use across providers which is crucial for my identification strategy. For each provider, I calculate the percentage of claims submitted with the form modifier before the reform. Figure 1.4 presents a histogram of these percentages across all providers.[14] We see huge variation in this form use and that many providers always give the form to every patient and that many providers never give the form to any patient. Figure 1.5 presents the persistence of this phenomenon after the reform in a scatterplot. On the horizontal axis is the percentage of claims with the form modifier before the reform and on the vertical axis is the percentage of claims with the form modifier after the reform. The scatterplot is weighted by the frequency of providers at a specific point. The large circles at the extremes indicate that many of the firms who never use the form before the reform persistently continue to not use the

[14]Providers with five or more claims are included in the histogram.

form after the reform and likewise for the providers who always use the form.

There are a couple reasons that explain this extreme variation in form use. CMS reports that a prominent cost of using the form is time. Time is required to confirm the coverage determinations and to fill out the form. CMS estimates that it takes approximately seven minutes for a provider to deliver each notice. After soliciting providers for comments, some providers stated that seven minutes is an underestimate and others stated that it was an overestimate, indicating heterogeneity in the cost of delivering the form. The range in time estimates is from 3 minutes to 15 minutes. This time cost of delivering the ABN is confirmed by recent efforts from health IT firms to streamline the process. In 2014 a firm announced the launching of VitalABN whose "innovative design and user interface saves time and frustration" in the ABN process.[15] Thus providers who never use the form may do so because the time cost is too high.

The second reason why providers might abstain from using this form altogether is the effect this form has on deterring patients.[16] In a release based on CMS statistics from 2005, CMS 2008 estimates that 1.3 million physicians, providers, practitioners, and suppliers potentially deliver this form and that this form was distributed 40,302,506 times to beneficiaries in 2005. In the same release CMS estimates that up to one third of beneficiaries who received an ABN chose not to receive the items and services.

A reason for why we might see this large group of providers who choose to always disseminate the form is the inability to predict denials paired with the desire to protect revenue. In this case, providers might choose to give the form

[15] see http://www.healthit.myindustrytracker.com/en/article/74194/taking-abn-validation-to-a-new-level-of-productivity-and-automation-vitalware-1 accessed on August 11, 2017

[16] This has both monetary consequences and consequences for altruism.

to everyone in order to be able to collect payment if the claim ends up being denied by Medicare.

What results is a situation where there are many providers not using discretion when distributing the form and this serves at the basis for the identification strategy. Since we cannot distinguish patients who did not get the document from patients who got the document and refused care, we can use this variation in provider use of the document to infer which patients are seeing the document and which ones are not. We would expect that the providers who always give their patients the ABN are the providers who will be affected by the reform to it. Furthermore, since these providers are always giving the form to their patients, any consequences of the reform on the utilization and prices of their services will be driven by patient response to the changing information on the form, not provider response to change their decision to use the form. The specific formulation of the empirical strategy using this insight is discussed in the next section.

1.6 Empirical Strategy and Estimates of Average Effects

In this section, I explain the formulation of the difference-in-differences strategy for obtaining the average effects of the reform (1.6.1) and present the estimates of the average effects (1.6.2). The outcomes examined are total number of claims submitted and average charge price. The findings are consistent with the model predictions discussed in section 1.4. In section 1.6.2, I present the robustness of the results to the definition of the treatment group and to the inclusion of providers in the analysis.

1.6.1 Empirical Strategy

The empirical strategy exploits the extreme variation in form use by providers to specify a difference-in-differences estimation strategy. Specifically, the empirical strategy takes advantage of the providers who always use and never use the ABN form. The intuition is that beneficiaries who visit the providers who always use the form are treated in the sense that they will start seeing prices after the reform to the ABN takes place. On the other hand, beneficiaries who visit providers who never use the form will not be affected by the reform. Thus a comparison of how utilization and price outcomes change between these two groups after the reform can be attributed to the additional price information.

For inference, the strategy employs a difference-in-differences approach where providers are in the treatment group (henceforth "Always Users") if they always use the form before and after the reform, and providers are in the control group (henceforth "Never Users") if they never use the form before and after the reform. A cross sectional approach which simply compares the treatment group the control group at a single time period might inadvertently pick up unobservables that are correlated with selection into these groups. The difference-in-differences strategy compares *trends* in the two groups, not *levels*, and I can also incorporate geographic and provider group fixed effects that are invariable over time that help to alleviate this concern. An approach that solely looks at changes among the Always Users before and after the reform might pick up trends that would have occurred regardless of the reform. In a difference-in-differences strategy, the inclusion of the Never Users helps to control for any general trends that affect all Medicare providers.

Table 1.4 presents summary statistics at the provider level for the Never Users (top panel) and the Always Users (bottom panel). We see differences between the two groups. Always Users have lower charge prices on average than Never Users, slightly higher procedures submitted, and higher denial rates. A cross sectional approach would attribute these differences to the use of the form, which may in fact not be the case. For example, the use of the form might drive prices down or providers with lower prices might be more likely to use the form. We see that many of the Always Users are gynecologists which may be explained by the portion of revenue that comes from these procedures. Since these procedures might contribute more to a gynecologist's revenue than to a family practitioner's, gynecologists might be more likely to use the form to secure their revenue in the case of denials.

This difference-in-differences strategy relies on the assumption that utilization and prices for the Always Users would have trended the same as the Never Users in absence of the reform. Thus, along with my main causal regressions, I perform pre-reform regressions and present graphs providing supporting evidence that the providers in the treatment group were not trending differently than the providers in the control group prior to the reform. I discuss the results of these supporting regressions in tandem with the main regression estimates.

The main equation for estimation of the effect of price transparency on utilization and charge prices is:

$$y_{kgzt} = \beta_0 \times Post_t + \beta_1 \times \text{Always User}_k + \beta_2 \times \text{Always User}_k \times Post_t + \delta_g + \gamma_z + \nu_{kgzt} \tag{1.10}$$

Where y_{kgzt} is an outcome variable for provider k with tax ID g in zip code z

at time period t. The variable Always User$_k \in \{0, 1\}$ indicates whether provider k is a provider who always user the form. The coefficient of interest is β_2 which captures the difference in outcome trends between Always Users and Never Users after the reform. The δ_g's are fixed effects among providers with the same tax identification number and the γ_z's are fixed effects among providers who operate in the same five digit zip code.[17]

1.6.2 Average Effects

Table 1.5 presents the estimates of the effect of price transparency on the total number of claims providers submit. The dependent variables are the natural logarithm of the variables of interest so the coefficients can be interpreted as percentage changes in the outcomes. The inclusion of tax ID and zip code fixed effects varies across the columns. The standard errors are clustered at the zip code level. For the utilization outcome, the model does not clearly predict what will be the sign of the effect on average. The empirical estimates confirm that the effect sizes are negative on average. Specifically, the total number of claims falls by 7.3% on average. I present the effects of price transparency on mean charges prices in table 1.6. I find that charge prices fall by 3.4% on average.

To provide visual support that the effects are the result of the reform and not from pre-existing trends, in figures 1.6 and 1.7, I plot coefficients to show that there was not a pattern distinguishable from zero in the outcomes before the reform. It is only after 2007 that we see the distinguishable patterns between the two groups emerge. To remove noise due to seasonality in the graphs, I group the

[17] In the preferred specification, standard errors are clustered at the zip code level. In consideration of the findings in Bertrand et al. 2004 regarding difference-in-differences estimation, finer and broader clusterings were considered.

data into six month periods. To test more finely for pre-existing differences in trends between the two groups, I group the data in two month periods and runs regressions on the pre-reform data to test for statistical differences. Table 1.7 displays the results of those regressions. Columns 1 and 2 have log(total claims) as the outcome. Column 1 indicates that there were no statistically different linear trends prior to the reform, and column 2 indicates that there were rarely statistically different trends when controlling with time period dummies. Time period five has a statistically higher bump for the treatment group. Since this is a positive coefficient, it cannot explain the negative effect sizes that I find. Columns 3 and 4 show the same with log(charge price) as the outcome.

There are two cutoffs chosen for the main specification, and I test the robustness of the estimates to these cutoffs. The first cutoff refers to whether a provider has enough claims to assert whether they are an Always User or Never User. In the main specification, I set this cutoff at five claims. In tables 1.8 and 1.9 I estimate the effects using differing cutoffs for total claims submitted and charge prices, respectively. Column 2 presents the results for the main specification and the other columns show the results for other cutoffs. We see that the sign of the results are robust to this choice. The second cutoff refers to the definition of an Always User. The main specification is strict in the definition of the treatment group. It defines an Always User to be a provider that gives the form to every patient. In the next robustness check I relax that definition and look at varying definitions of high users as the treatment group. Tables 1.10 and 1.11 present the results for total claims and charge prices, respectively. Column 1 presents the results for the main specification and the other columns relax this strict definition. We see robustness in the effects across the specifications.

1.7 Heterogeneity in Effects

Although I find an average negative effect on the number of claims submitted, the model predicts that this effect size should vary with the prices shown. To test this prediction, I group the providers into terciles depending on their average charge price before the reform and allow the treatment effect to vary depending on the tercile.

To test for heterogeneity in the effect of price transparency by prices I estimate the following equation:

$$\begin{aligned} y_{kgzt} =& \beta_0 \times Post_t + \beta_1 \times \text{Always User}_k + \beta_2 \times \text{Always User}_k \times Post_t \\ &+ \text{Always User}_k \times Post_t \times \sum_{i=2}^{3} \alpha_i 1\{k \in tercile_i\} + \delta_g + \gamma_z + \nu_{kgzt} \end{aligned} \tag{1.11}$$

The summation is over the upper two terciles. The regression is testing whether the effect sizes at providers in the the upper two charge price terciles differ statistically from the lowest tercile. The results of this regression are presented in table 1.12 in column 1. The variable "Mid Prices" is a dummy that is one for providers in the second tercile and zero otherwise. The variable "High Prices" is a dummy that is one for providers in the highest tercile and zero otherwise.

Although the coefficients trend in the expected direction as we read down the column, there are a few surprising results. First, the effect of the reform for the lowest tercile providers are statistically indistinguishable from zero. This is surprising because the model predicted that utilization might rise at these providers. One explanation might be that providers were supplying price information prior to the reform since their prices were low. As expected the effect size for the highest tercile is large, negative, and statistically different from the

lowest tercile. These results indicate that the effects are concentrated at the high priced providers. Column 1 of table 1.13 shows the results of a similar regression with charge prices at the outcome variable. We see no heterogeneity in the effect on prices.

A second prediction of the model is that the reform should only have effects for patients who are uninformed about prices. To test this prediction, I rank providers by the percentage of claims that come from relatively new-to-Medicare beneficiaries, meaning beneficiaries that are younger than 70 years old. I run a regression to see if the effect size for providers who rank in the upper quartile of this percentage is statistically different from those providers in the lower three quartiles. The idea is that, since this is a repetitive preventive procedure, older beneficiaries might be more informed about the prices and denial rates of this procedure and hence the reform should have less of an effect on them. The specific regression is

$$\begin{aligned} y_{kgzt} =& \beta_0 \times Post_t + \beta_1 \times \text{Always User}_k + \beta_2 \times \text{Always User}_k \times Post_t \\ &+ \beta_3 \times \text{Always User}_k \times Post_t \times 1\{k \in \textit{upper quartile}\} + \delta_g + \gamma_z + \nu_{kgzt} \end{aligned} \tag{1.12}$$

The results of this regression are presented in table 1.12 column 2. The variable "New to Medicare Beneficiaries" is a dummy that is one for providers who are in this upper quartile and zero otherwise. The results confirm that the effect size is higher for providers who service relatively new to Medicare beneficiaries. These results are suggestive of the model prediction that the effects are concentrated on the uninformed but certainly do not prove it. An alternative explanation for the regression result is that younger people are more able to process information than their older counterparts. Column 2 of table 1.13 shows the results of

a similar regression with charge prices at the outcome variable. We see no heterogeneity in the effect on prices.

In another test for heterogeneity, I run the regression 1.10 separately for providers who are the only large provider in their zip code and for providers who are one of at least two large providers in their zip code. Although I do not explicitly take this into account in the model, this exercise provides suggestive evidence of how the presence (or lack) of competitors change the effects of price transparency.

Tables 1.14 and 1.15 display the results of these regressions for total number of claims and charge prices, respectively. The first four columns present the results for providers who are the only one in their zip code accounting for varying fixed effects, and the last four columns present the results for providers who are one of multiple providers in their zip code. We see that the price reductions are concentrated to providers who face competitors in their zip code reduce prices and that reductions in the number of claims are concentrated to providers who are the only large provider in their zip code. One surprising result of the earlier regressions was that both utilization and prices fall on average. The results discussed here demonstrate that although both these reductions might occur on average, they might not simultaneously occur at a single provider. The results also provide further evidence that there are actual reductions in medical care use, and that our findings are not just picking up patients switching from providers in the treatment group to the control group.

1.8 Conclusion

In this paper I make use of a Medicare Part B reform to expand our knowledge of the effects of price transparency on health care utilization and prices. I demonstrate that price information given directly to the patient in the doctor's office has consequences for health care spending. Consistent with a model of medical decision-making that explicitly incorporates uncertainty over prices, I find that price information given directly to the patients reduces both charge prices and the number of claims providers submit, on average. I find that the effects on the number of claims are more pronounced for providers with high prices and for providers who service new-to-Medicare beneficiaries. Finally, I find that the effect sizes vary with the competitive environment: providers who face little competition in their zip code do not reduce prices and experience a fall in claims, where the opposite is true for providers who face competition in their zip code, who reduce prices and do not experience a fall in claims. For these results, I focused on preventive gynecological procedures. Closely related future research should extend this analysis to other procedures.

There are three reasons that could explain why this research found effects on utilization when other research papers have found little or no effect of charge price disclosure. First, the procedures explored in this research are preventive procedures which are known to be among the most price elastic. Second, the information is salient in that it is given directly to the patient; the patient does not have to incur search costs in order to obtain this information from a website. Third, the charge price information is given with an explanation of what the charge price means. Specifically, the ABN tells the patient that the charge price

is the price they will have to pay in the event of denial, making the price relevant to them.

The findings suggest methods for improving the efficacy of price transparency initiatives in the health care sector. Policies intending to implement effective price transparency should focus more on price elastic procedures which are typically performed in physician offices as opposed to current regulations which require hospitals to post information. Second, given the complexity of the pricing system, along with the prices, there should be information indicating how the presented price is relevant to the patient. With this information the patient will be able to make a more informed decision about whether and where to seek medical care. For example, this research indicates that giving patients charge price information *and* telling them under what circumstances they would have to pay the charge price makes the patient responsive to this price. This research also demonstrates that giving price information directly to patients is effective in reducing prices and utilization. Thus policies should be more aggressive in delivering price information directly to patients to ensure that patients are able to make price-based decisions. Future research could help to identify which of these components make price transparency initiatives the most effective.

There are a few limitations of this research. First, this research focuses on the Medicare population. Although this allows me to study a national sample, this population is older and has different medical care patterns than those with commercial insurance, and hence it is not clear whether these results extend to the general population. Second, the nature of the Medicare regulation restricts

me to study the effects of price transparency using specific, low priced, preventive, and arguably idiosyncratic procedures. I cannot say what the effects would be for a set of procedures with more general applicability. Third, the claims data do not contain detailed demographic information, so tests for heterogeneity across patients with varying demographic characteristics is infeasible. Fourth, given the limited time frame of the dataset, I am unable to make conclusions about long term health outcomes. It could be the case that beneficiaries are cutting back on either unnecessary medical care or necessary care upon receiving pricing information, and information on future health outcomes would help to disentangle the two. More research is necessary to address these limitations.

This paper has uncovered a unique opportunity for future research that will allow us to better understand price transparency from the provider's perspective. The goal of this paper is to establish that giving price information directly to patients has consequences for prices and utilization. Along the way in establishing this result, we have found a scenario where providers give price and coverage information at their own discretion, and this decision is observable in the dataset. This endogenous information dissemination decision was not the focus of this paper but rather a complication that the empirical strategy sought to overcome. In chapter two, I shift the focus towards this endogenous information dissemination decision to understand price uncertainty in the health care sector from the provider's perspective. By understanding which provider characteristics and patient characteristics influence the provider's decision to disseminate information, we can better understand how financial incentives and altruistic incentives interplay in provider's preferences. Furthermore, research tends to take price uncertainty in the health care market as given, but research

into the provider's decision to disseminate information could help to explain the reasons for the existence of price uncertainty in the first place. Is it that providers do not know the information themselves and thus cannot provide the information, or is it that providers strategically choose to withhold information? Research using the setting and variation discovered in this paper can help to answer these questions.

1.9 Figures and Tables

Figure 1.1: Advance Beneficiary Notice of Noncoverage Before the Reform

Patient's Name: Medicare # (HICN):

ADVANCE BENEFICIARY NOTICE (ABN)

NOTE: You need to make a choice about receiving these health care items or services.

We expect that Medicare will not pay for the item(s) or service(s) that are described below. Medicare does not pay for all of your health care costs. Medicare only pays for covered items and services when Medicare rules are met. The fact that Medicare may not pay for a particular item or service does not mean that you should not receive it. There may be a good reason your doctor recommended it. Right now, in your case, **Medicare probably will not pay for –**

Items or Services:
Because:

The purpose of this form is to help you make an informed choice about whether or not you want to receive these items or services, knowing that you might have to pay for them yourself. Before you make a decision about your options, you should **read this entire notice carefully.**

- Ask us to explain, if you don't understand why Medicare probably won't pay.
- Ask us how much these items or services will cost you (**Estimated Cost: $**_____), in case you have to pay for them yourself or through other insurance.

PLEASE CHOOSE **ONE** OPTION. CHECK **ONE** BOX. **SIGN & DATE** YOUR CHOICE.

☐ **Option 1. YES. I want to receive these items or services.**

I understand that Medicare will not decide whether to pay unless I receive these items or services. Please submit my claim to Medicare. I understand that you may bill me for items or services and that I may have to pay the bill while Medicare is making its decision. If Medicare does pay, you will refund to me any payments I made to you that are due to me. If Medicare denies payment, I agree to be personally and fully responsible for payment. That is, I will pay personally, either out of pocket or through any other insurance that I have. I understand I can appeal Medicare's decision.

☐ **Option 2. NO. I have decided not to receive these items or services.**

I will not receive these items or services. I understand that you will not be able to submit a claim to Medicare and that I will not be able to appeal your opinion that Medicare won't pay.

Date **Signature of patient or person acting on patient's behalf**

NOTE: Your health information will be kept confidential. Any information that we collect about you on this form will be kept confidential in our offices. If a claim is submitted to Medicare, your health information on this form may be shared with Medicare. Your health information which Medicare sees will be kept confidential by Medicare.

OMB Approval No. 0938-0566 Form No. CMS-R-131-G (June 2002)

Figure 1.2: Advance Beneficiary Notice of Noncoverage After the Reform

***(A)* Notifier(s):**
***(B)* Patient Name:** ***(C)* Identification Number:**

ADVANCE BENEFICIARY NOTICE OF NONCOVERAGE (ABN)

NOTE: If Medicare doesn't pay for ***(D)*_____** below, you may have to pay.

Medicare does not pay for everything, even some care that you or your health care provider have good reason to think you need. We expect Medicare may not pay for the ***(D)*_____** below.

***(D)* _____**	***(E)* Reason Medicare May Not Pay:**	***(F)* Estimated Cost:**

WHAT YOU NEED TO DO NOW:

- Read this notice, so you can make an informed decision about your care.
- Ask us any questions that you may have after you finish reading.
- Choose an option below about whether to receive the ***(D)*_____**listed above.
  Note: If you choose Option 1 or 2, we may help you to use any other insurance that you might have, but Medicare cannot require us to do this.

***(G)* OPTIONS:**	**Check only one box. We cannot choose a box for you.**

❑ **OPTION 1.** I want the ***(D)*_____** listed above. You may ask to be paid now, but I also want Medicare billed for an official decision on payment, which is sent to me on a Medicare Summary Notice (MSN). I understand that if Medicare doesn't pay, I am responsible for payment, but **I can appeal to Medicare** by following the directions on the MSN**.** If Medicare does pay, you will refund any payments I made to you, less co-pays or deductibles.

❑ **OPTION 2.** I want the ***(D)*_____** listed above, but do not bill Medicare. You may ask to be paid now as I am responsible for payment. **I cannot appeal if Medicare is not billed**.

❑ **OPTION 3.** I don't want the ***(D)*_____**listed above. I understand with this choice I am **not** responsible for payment**,** and **I cannot appeal to see if Medicare would pay.**

***(H)* Additional Information:**

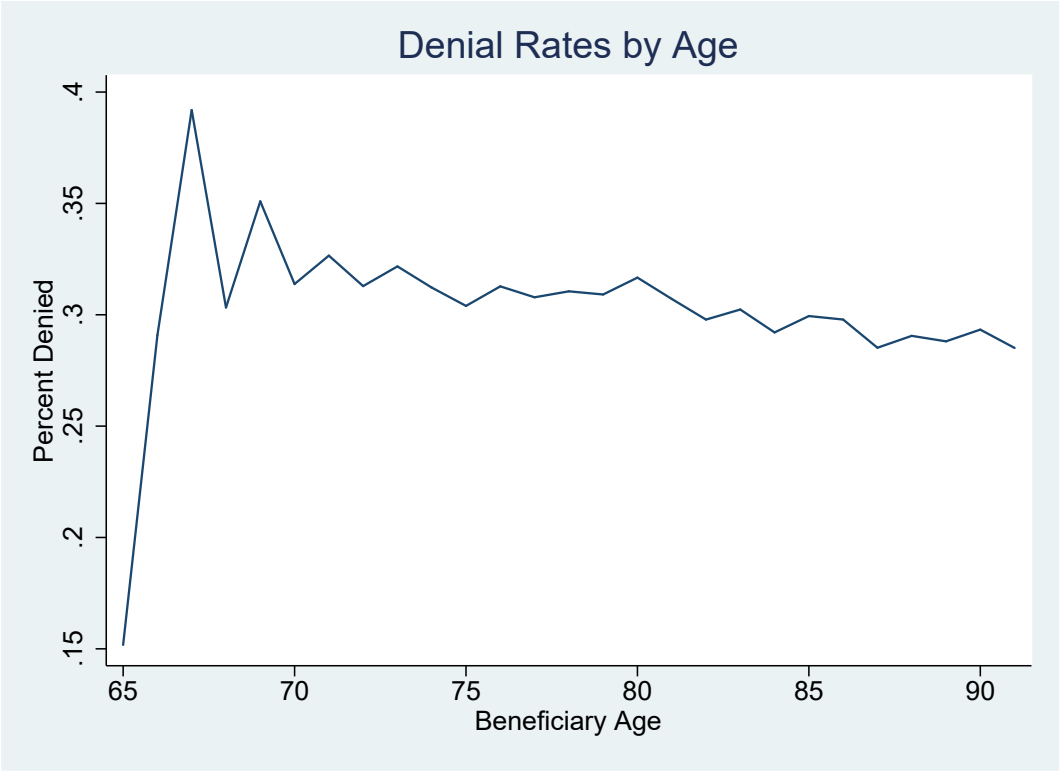
This notice gives our opinion, not an official Medicare decision. If you have other questions on this notice or Medicare billing, call **1-800-MEDICARE** (1-800-633-4227/**TTY**: 1-877-486-2048).

Signing below means that you have received and understand this notice. You also receive a copy.

***(I)* Signature:**	***(J)* Date:**

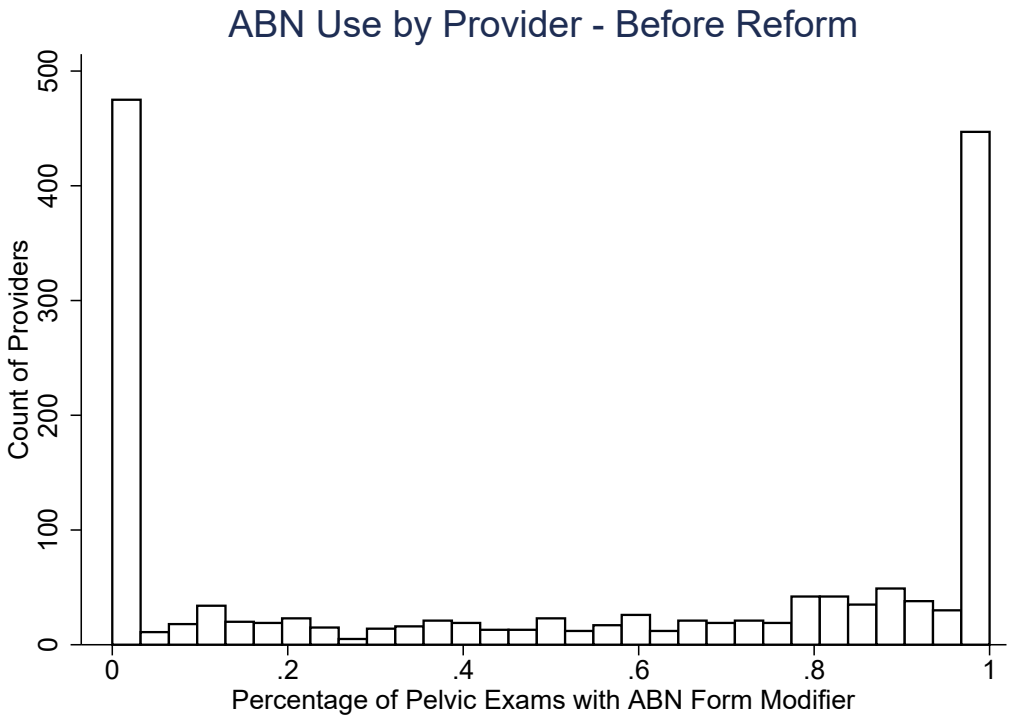
Form CMS-R-131 (03/08) Form Approved OMB No. 0938-0566

Figure 1.3: Denial Rates by Age



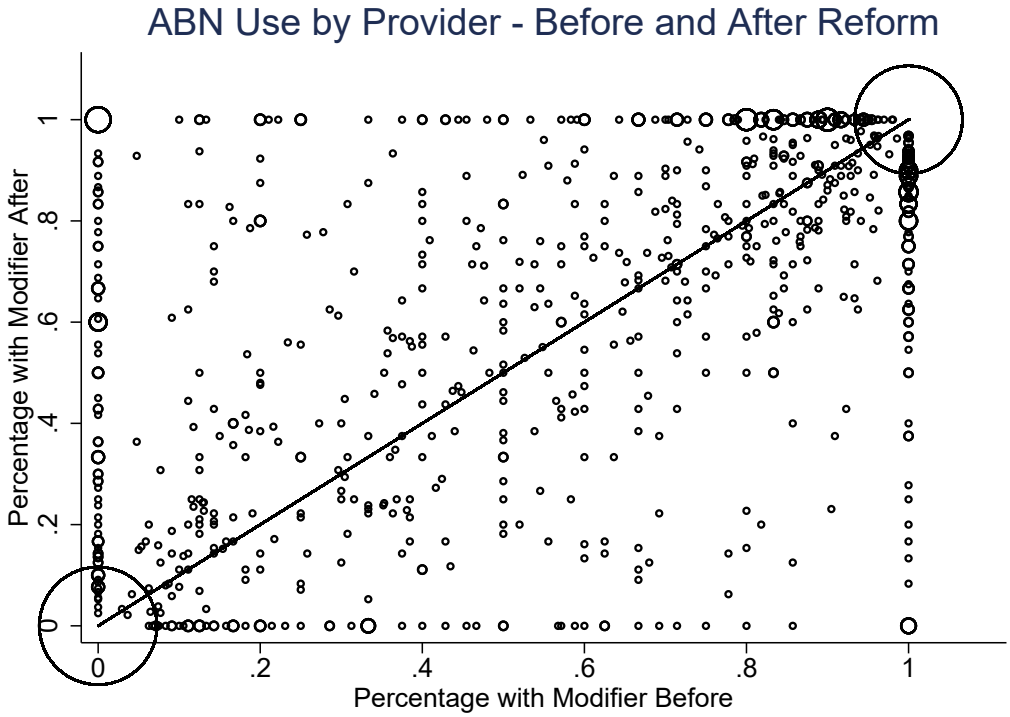
This graph shows the denial rates by age. We see that they are quite noisy for younger ages, jumping up to almost 40%, before smoothing out and leveling.

Figure 1.4: ABN Use Before the Reform



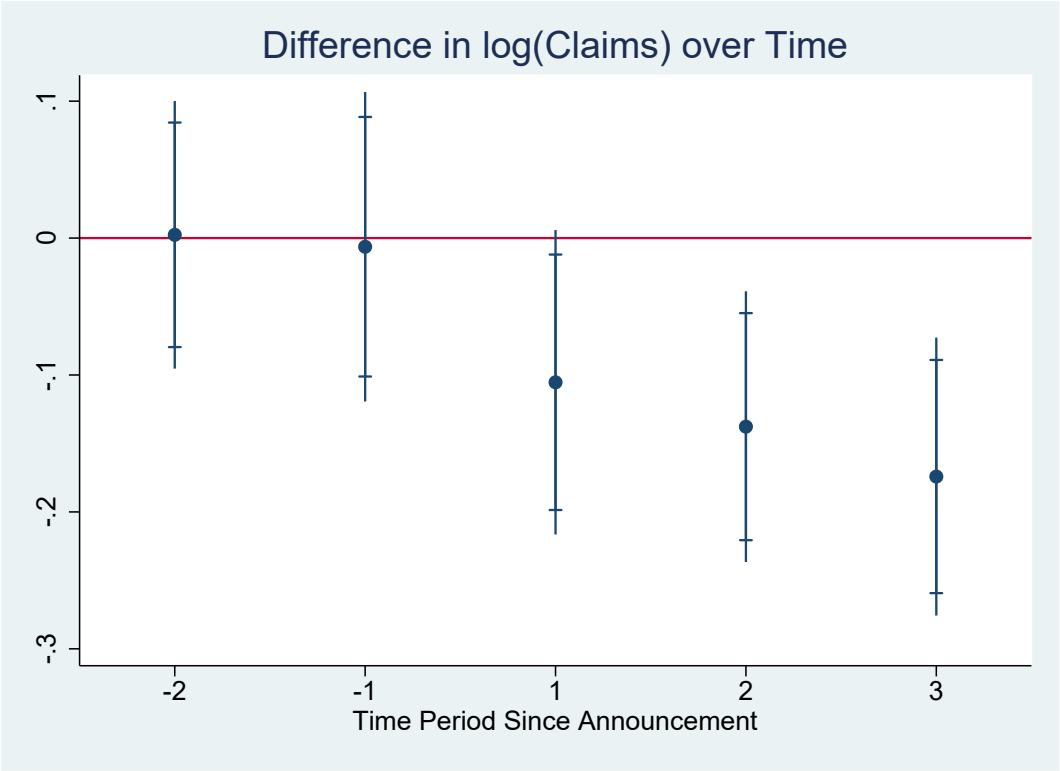
This histogram presents the distribution of the proportion of pelvic examinations with the ABN modifier across providers in the first six months of data (before the reform). This is a measure of form use. The findings suggest that many providers are giving the form to everyone without discretion, and many other providers refrain from using the form altogether. Only providers with more than 5 claims are included to ensure that the extremes are not an artifact driven by providers with only very few claims.

Figure 1.5: Persistence in ABN Use by Provider



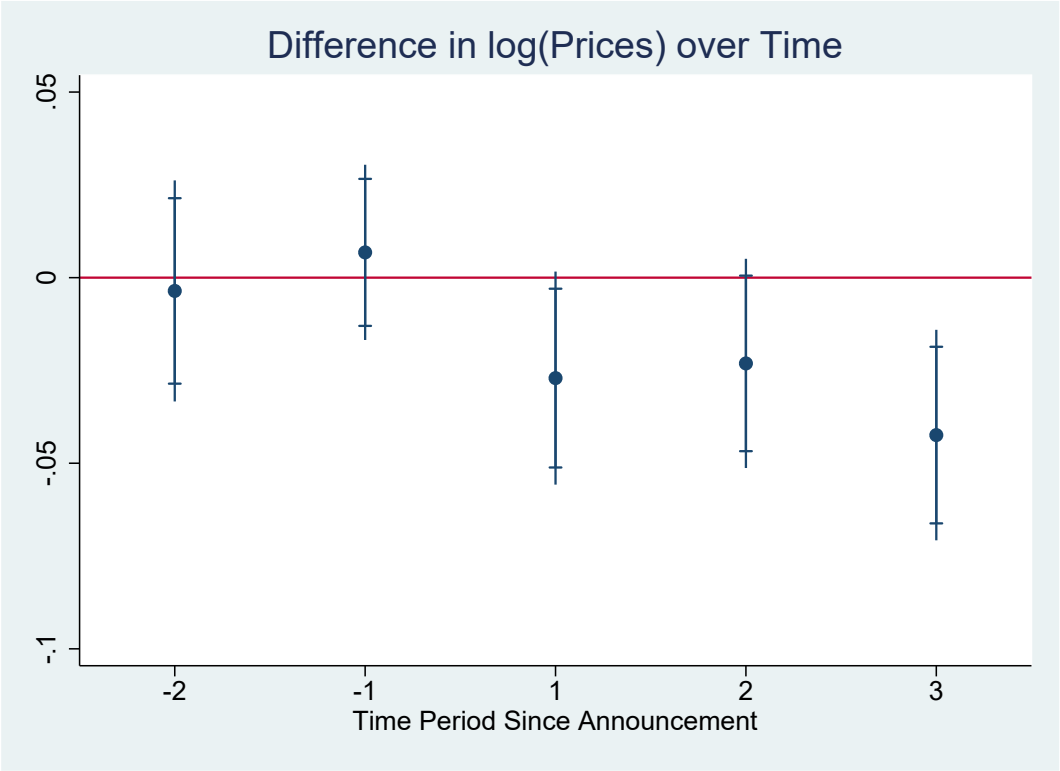
This is a scatter plot of form use before and after the reform. It is weighted by the number of firms at a specific point. The large circles on the ends of the diagonal indicate that many providers persistently never use the form and many firms persistently always use the form.

Figure 1.6: Difference in Claims over Time



This is a plot of the coefficients estimating the differences in total number of claims submitted between the Always Users and the Never Users after controlling for a level difference. The coefficients are for six month periods relative to the first six months of 2008. The dots are the coefficient estimates and the vertical lines are the confidence intervals. The dashes indicate the ends of the 90% confidence interval and the entire line represents the 95% confidence interval.

Figure 1.7: Difference in Prices over Time



This is a plot of the coefficients estimating the differences in mean charge prices submitted between the Always Users and the Never Users after controlling for a level difference. The coefficients are for six month periods relative to the first six months of 2008. The dots are the coefficient estimates and the vertical lines are the confidence intervals. The dashes indicate the ends of the 90% confidence interval and the entire line represents the 95% confidence interval.

Table 1.1: ABN Form use by Procedure

HCPCS Code	Procedure Name	% Modifier	% Denied	Mean Charge ($)	Mean Allowed ($)	Count
G0101	Preventive Pelvic Exam	45	31	67.75	23.92	26,190
Q0091	Preventive Pap Smear	39	31	52.99	26.24	23,957
G0103	Prostate Cancer Screening	17	19	81.51	21.24	29,972
98940	Chiropractic Manipulative Treatment (1-2 Regions)	16	14	35.66	20.47	128,067
98942	Chiropractic Manipulative Treatment (5 Regions)	16	13	55.68	38.13	38,496
98941	Chiropractic Manipulative Treatment (3-4 Regions)	15	12	45.60	28.96	261,688
G0328	Colorectal Cancer Screening	13	19	45.11	17.85	7,492
77080	Hip, Spine or Central DEXA	13	12	177.08	47.13	54,520
G0145	Screening Cytopathology	13	25	80.48	27.16	12,971
G0123	Screening Cytopathology	11	25	66.87	20.76	10,191
85730	Hematology and Coagulation Procedure	11	31	33.02	5.86	17,581
98943	Chiropractic Manipulative Treatment (Extraspinal)	11	98	39.20	.55	6,320
84153	Prostate Specific Antigen	11	18	80.53	21.61	67,573
80061	Lipid Panel	11	8	67.34	13.51	369,956
99397	Routine Examination	10	99	153.78	.01	20,486

This table shows the top procedure codes that are accompanied by the ABN modifier using a 10% random sample of the dataset for ease of computation.

Table 1.2: Procedure Count by Age

Age	Count of Procedures	Percent
65	13,045	6
66	18,653	8
67	17,136	8
68	15,943	7
69	15,003	7
70	14,155	6
71	13,293	6
72	12,756	6
73	12,178	5
74	11,056	5
75	10,142	4
76	9,464	4
77	8,897	4
78	8,276	4
79	7,596	3
80	6,710	3
81	5,890	3
82	5,100	2
83	4,402	2
84	3,749	2
85	3,146	1
86	2,481	1
87	1,960	1
88	1,480	1
89	1,090	0
90	750	0
91	477	0
92	354	0
93	219	0
94	175	0
95	86	0
96	66	0
97	30	0
98	25	0
99+	21	0
Total	225,804	100

This table shows the distribution of procedures submitted by age. These procedures are performed mostly on younger beneficiaries.

Table 1.3: Part B Summary Statistics - Preventive Pelvic Examinations

	mean	sd	min	p1	p99	max	count
2007							
Charge Price	65.946	37.90	0.00	30.00	195.00	4000.00	78050
Allowed Price	34.615	3.30	0.00	27.19	42.39	46.69	53252
Denied	0.318	0.47	0.00	0.00	1.00	1.00	78050
ABN Modifier	0.464	0.50	0.00	0.00	1.00	1.00	78050
Black	0.051	0.22	0.00	0.00	1.00	1.00	78050
Non-White & Non-Black	0.029	0.17	0.00	0.00	1.00	1.00	78050
Age	73.265	6.13	65.00	65.00	89.00	101.00	78050
2008							
Charge Price	67.006	74.50	0.00	30.00	200.00	17500.00	74873
Allowed Price	34.441	3.20	0.00	27.15	41.77	45.02	52087
Denied	0.304	0.46	0.00	0.00	1.00	1.00	74873
ABN Modifier	0.476	0.50	0.00	0.00	1.00	1.00	74873
Black	0.052	0.22	0.00	0.00	1.00	1.00	74873
Non-White & Non-Black	0.029	0.17	0.00	0.00	1.00	1.00	74873
Age	73.064	6.19	65.00	65.00	89.00	104.00	74873
2009							
Charge Price	68.512	52.97	0.00	31.18	200.00	6750.00	72795
Allowed Price	34.134	3.00	0.00	26.95	40.73	44.07	51840
Denied	0.288	0.45	0.00	0.00	1.00	1.00	72795
ABN Modifier	0.483	0.50	0.00	0.00	1.00	1.00	72795
Black	0.054	0.23	0.00	0.00	1.00	1.00	72795
Non-White & Non-Black	0.037	0.19	0.00	0.00	1.00	1.00	72795
Age	73.017	6.22	65.00	65.00	90.00	101.00	72795

Table 1.4: Provider Summary Statistics by Form Use

	mean	sd	min	max	count
Never Users					
Percent Denied	0.298	0.22	0.00	1.00	377
Procedures Submitted	11.684	9.50	5.00	101.00	377
Mean Charge Price	65.361	31.54	22.00	211.00	377
Percentage New Patients	0.433	0.22	0.00	1.00	377
Percentage Black Patients	0.074	0.14	0.00	1.00	377
Percentage High Risk	0.050	0.16	0.00	1.00	377
Gynecologist	0.516	0.45	0.00	1.00	377
Participates in Medicare	0.967	0.17	0.00	1.00	377
Group Practice	0.096	0.21	0.00	1.00	377

	mean	sd	min	max	count
Always Users					
Percent Denied	0.344	0.20	0.00	0.88	317
Procedures Submitted	12.038	7.63	5.00	55.00	317
Mean Charge Price	60.868	33.73	29.55	222.73	317
Percentage New Patients	0.371	0.19	0.00	1.00	317
Percentage Black Patients	0.049	0.11	0.00	1.00	317
Percentage High Risk	0.074	0.15	0.00	1.00	317
Gynecologist	0.951	0.18	0.00	1.00	317
Participates in Medicare	0.886	0.31	0.00	1.00	317
Group Practice	0.051	0.19	0.00	1.00	317

Table 1.5: Effect on Number of Claims Submitted to Medicare

	(1)	(2)	(3)	(4)
Always User × Post	-.088***	-.045*	-.073***	-.040*
	(.024)	(.023)	(.024)	(.023)
Tax ID FE	N	N	Y	Y
Zip Code FE	N	Y	N	Y
Obs.	13088	13088	13088	13088

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the effects of price transparency on the total number of claims submitted to Medicare. The outcome is log(total claims) so the coefficients can be interpreted as percentage effects.

Table 1.6: Effect on Charge Prices

	(1)	(2)	(3)	(4)
Always User × Post	-.023*	-.032***	-.034***	-.034***
	(.013)	(.011)	(.010)	(.011)
Tax ID FE	N	N	Y	Y
Zip Code FE	N	Y	N	Y
Obs.	13088	13088	13088	13088

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the effects of price transparency on the total charges submitted to Medicare. The outcome is log(mean charge price) so the coefficients can be interpreted as percentage effects.

Table 1.7: Pre-Reform Trends

	(1)	(2)	(3)	(4)
Always User × Linear Time Trend	.011	.	-.0007	.
	(.009)		(.004)	
Linear Time Trend	-.020***	.	.004*	.
	(.006)		(.002)	
Always User × Time Period 2	.	-.004	.	.004
		(.069)		(.020)
Always User × Time Period 3	.	.010	.	-.011
		(.069)		(.018)
Always User × Time Period 4	.	.021	.	.025
		(.070)		(.019)
Always User × Time Period 5	.	.151**	.	-.014
		(.069)		(.023)
Always User × Time Period 6	.	.006	.	-.019
		(.070)		(.022)
Always User × Time Period 7	.	.043	.	.010
		(.065)		(.022)
Time Period 2	.	-.010	.	-.013
		(.044)		(.015)
Time Period 3	.	-.003	.	.002
		(.045)		(.012)
Time Period 4	.	-.029	.	-.010
		(.047)		(.013)
Time Period 5	.	-.011	.	.008
		(.045)		(.014)
Time Period 6	.	-.032	.	.025*
		(.044)		(.015)
Time Period 7	.	-.165***	.	.009
		(.044)		(.016)
Tax ID FE	Y	Y	Y	Y
Obs.	5279	5279	5279	5279

Standard errors are in parentheses and clustered at the zip code level.
*10%, ** 5%, ***1% significance

This table reports if there are any pre-reform differences in trends between Always Users and Never Users. The outcome variable for the first two columns is log(total claims). The first column tests if there is a differing linear trend, and the second column tests if there are differing trends when the time trend is accounted for with flexible dummies. The third and fourth columns test the same with log(mean charge price) as the outcome variable.

Table 1.8: Effect on Number of Claims Submitted to Medicare - Robustness

	>= 3	>= 5	>= 7	>= 9	>= 11	>= 15
Always User × Post	-.041**	-.073***	-.073**	-.094**	-.114**	-.152**
	(.018)	(.024)	(.031)	(.039)	(.048)	(.065)
Tax ID FE	Y	Y	Y	Y	Y	Y
Obs.	20674	13088	9256	6671	4518	2670

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the robustness of the effects of price transparency on the total number of claims submitted to Medicare with regards to the provider inclusion criterion. Column 1 sets the criterion to be three or more claims, column 2 to be five or more etc.

Table 1.9: Effect on Charge Prices - Robustness

	>= 3	>= 5	>= 7	>= 9	>= 11	>= 15
Always User × Post	-.027***	-.034***	-.026**	-.029**	-.038**	-.086***
	(.009)	(.010)	(.012)	(.015)	(.018)	(.019)
Tax ID FE	Y	Y	Y	Y	Y	Y
Obs.	20674	13088	9256	6671	4518	2670

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the robustness of the effects of price transparency on the mean charge prices with regards to the provider inclusion criterion. Column 1 sets the criterion to be three or more claims, column 2 to be five or more etc.

Table 1.10: Effect on Number of Claims Submitted to Medicare - Robustness

	1.00	.95	.90	.85	.80	.75	.70	.65
High Form Use × Post	-.073***	-.066***	-.068***	-.063***	-.059**	-.059**	-.061***	-.061***
	(.024)	(.025)	(.024)	(.023)	(.023)	(.023)	(.023)	(.023)
Tax ID FE	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	13088	13606	14710	16451	18379	19154	20051	20728

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the robustness of the effects of price transparency on the total number of claims submitted to Medicare with regards to the definition of an "Always User". Column 1 sets the criterion to be the modifer accompanies 100% of claims, column 2 to be 95% of claims etc.

Table 1.11: Effect on Charge Prices - Robustness

	1.00	.95	.90	.85	.80	.75	.70	.65
High Form Use × Post	-.034***	-.044***	-.040***	-.036***	-.034***	-.031***	-.031***	-.032***
	(.010)	(.011)	(.010)	(.009)	(.009)	(.008)	(.008)	(.008)
Tax ID FE	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	13088	13606	14710	16451	18379	19154	20051	20728

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the robustness of the effects of price transparency on mean charge prices with regards to the definition of an "Always User". Column 1 sets the criterion to be the modifer accompanies 100% of claims, column 2 to be 95% of claims etc.

Table 1.12: Heterogeneity in the Effect on the Number of Claims Submitted to Medicare

	(1)	(2)
Always User × Post	.017	-.010
	(.038)	(.024)
Always User × Post × Mid Prices	-.064	.
	(.059)	
Always User × Post × High Prices	-.133**	.
	(.057)	
Always User × Post × New-to-Medicare Patients	.	-.123**
		(.054)
Tax ID FE	Y	Y
Zip Code FE	Y	Y
Obs.	13088	13088

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the heterogeneous effects of price transparency on the number of claims submitted to Medicare. The outcome for both columns is log(total claims). Column 1 allows the effect size to vary by the charge price of the provider and column 2 allows the effect to vary by the percentage of new-to-Medicare patients the provider services.

Table 1.13: Heterogeneity in the Effect on Charge Prices

	(1)	(2)
Always User × Post	-.039**	-.042***
	(.017)	(.012)
Always User × Post × Mid Prices	.027	.
	(.024)	
Always User × Post × High Prices	-.035	.
	(.035)	
Always User × Post × New-to-Medicare Patients	.	.036
		(.028)
Tax ID FE	Y	Y
Zip Code FE	Y	Y
Obs.	13088	13088

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table reports the heterogeneous effects of price transparency on charge prices. The outcome for both columns is log(mean charge price). Column 1 allows the effect size to vary by the charge price of the provider and column 2 allows the effect to vary by the percentage of new-to-Medicare patients the provider services.

Table 1.14: Effect on Number of Claims Submitted to Medicare by # of Providers

	Only Provider in Zip		Multiple Providers in Zip			
	(1)	(2)	(3)	(4)	(5)	(6)
Always User × Post	-.112***	-.086***	-.075*	-.041	-.048	-.029
	(.032)	(.031) (.039)	(.038)	(.040)	(.038)	
Tax ID FE	N	Y	N	N	Y	Y
Zip Code FE	N	N	N	Y	N	Y
Obs.	7299	7299	5789	5789	5789	5789

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table estimates the effects of price transparency on log(total claims). The first four columns restrict the regression to providers who are the only large provider in their zip code. The second four columns restrict the regression to providers in zip codes with multiple large providers.

Table 1.15: Effect on Charge Prices by # of Providers

	Only Provider in Zip		Multiple Providers in Zip			
	(1)	(2)	(3)	(4)	(5)	(6)
Always User × Post	-.020	-.026*	-.017	-.031**	-.033**	-.036***
	(.018)	(.016)	(.020)	(.015)	(.014)	(.014)
Tax ID FE	N	Y	N	N	Y	Y
Zip Code FE	N	N	N	Y	N	Y
Obs.	7299	7299	5789	5789	5789	5789

Standard errors are in parentheses and clustered at the zip code level.
*10%, **5%, ***1% significance

This table estimates the effects of price transparency on log(mean charge price). The first four columns restrict the regression to providers who are the only large provider in their zip code. The second four columns restrict the regression to providers in zip codes with multiple large providers.

Chapter 2

Information Disclosure in the Presence of General Uncertainty: Evidence from Medicare Part B

2.1 Introduction

The United States' health care payment system is fraught with complexity. Patients are commonly complaining of unexpected medical bills, the consequences of which can be quite severe. For example the Brookings Institute recently hosted a seminar on "solving surprise medical bills", meant to discuss the issue of patients being hit with a bill from a out-of-network provider when they had originally seen an in-network provider. There are also cases of individuals who have gone to emergency departments and are subsequently admitted to the hospital only to find that their insurer will not pay because the admission did not meet the standard of medical necessity. As discussed in Gresenz and Studdert (2004) and Tintinalli (2000), these denials can occur even when a "prudent layperson" would have agreed that the symptoms meet the standard for an emergency medical condition.

Cases of unexpected medical bills can be financially devastating not only because the insurer no longer picks up a percentage of the bill but because the beneficiary may no longer be entitled to the prices negotiated by their insurer. Instead the beneficiary may find themselves responsible for paying the list prices, the price that an uninsured would have to pay, which are widely regarded as exorbitant and tough to decipher (Reinhardt, 2006). In scenarios of medical urgency, such financial shocks may be unavoidable. In less severe cases when the beneficiary has time to make a less costly decision, and would have had they been informed of the consequences, policy makers are seeing the possibility for health care savings through increased information dissemination.

A commonly suggested policy to alleviate surprise bills is for physicians to simply warn patients directly when a procedure will trigger an unexpected out-of-pocket expense. This gives patients a chance to make a different, perhaps less costly, decision which will in turn reduce spending. Such policies are appealing in that the information is salient and given from a trusted source. These policies, however, rely heavily on the assumption that physicians can accurately predict such scenarios. This may not be a sound assumption. Given the design of the payment system in health care there are numerous fee schedules that physicians must consult to determine prices. It is at least the physician-insurer pair, not the physician identity alone, that determines whether or not a procedure will trigger an unexpected out-of-pocket expense. This is further complicated by the possibility that patient utilization in the policy year can trigger unexpected out-of-pocket expenses. For example, certain procedures might be subject to frequency limitations, in which case the physician-insurer-patient

triplet is necessary to concretely determine if a procedure will trigger an unexpected out-of-pocket expense. These complexities have the potential to make it costly, if not impossible, for physicians to accurately identify when a procedure will trigger an out-of-pocket expense to the patient. Although policies calling for physician notifications have been suggested, to my knowledge, there is little empirical research examining the results and efficacy of such notification policies.

In this paper, I empirically examine physician notification, or disclosure, strategies under a health care policy that incentivizes physicians to warn patients about insurance non-coverage. Specifically, I examine the use of a Medicare Part B document that physicians use to inform patients that a claim will be denied by Medicare. As per Medicare rules, the incentive to use the document is that in the event of non-coverage, if the physician did not give the patient this document then they may not seek payment from the patient. Initial examination of the data uncovers non-trivial strategies in distributing this document. First, many physicians tend to over use this document, meaning that they give this document to patients whose claims end up being ex-post accepted by Medicare, and inversely many physicians under use this document, meaning they do not give it to patients whose claims end up being ex-post denied be Medicare. In fact, some physicians employ a blanket distribution strategy, meaning they give this document to every patient that walks in the door, and some physicians never give the document to anyone. What makes this latter finding most surprising is that all else equal, as per the Medicare rules, not giving the document to patients who end up being denied is akin to leaving money on the table.

At first these strategies of both over and under disclosure are surprising, but

they can be rationalized when considering the context. Suppose physicians and patients cannot perfectly predict denials. Some physicians they might err in the direction of giving this document to every patient in order to protect their revenue. On the flip side, if this document can deter patients from having the procedure done or it is costly to disseminate this information, then there is incentive to under use the document. At worst a physician might unintentionally deter a patient who would have been covered by mistakenly giving them the document. Deterring a patient from having the procedure performed has two downsides for the physician. First it directly reduces revenue. Second it reduces the provider payoff due to physician altruism, an important aspect of physician decision-making first discussed by Arrow (1963) and subsequently incorporated into models by Newhouse (1970), Woodward and Warren-Boulton (1984), and Farley (1986). Physician altruism means that physicians gain utility from the well-being of the patient, and if the patient refuses a procedure that the physician thinks is necessary, this will be at a cost to the physician. If both the physician and the patient (or at least the patient) have no uncertainty over the denial outcome, then giving the document to a patient who will be accepted by Medicare should have no deterrence consequence, and physician dissemination strategies should not depend on the presence of a deterrence consequence.

I test for the existence of general uncertainty over the denial outcome by testing whether physicians' dissemination strategies respond to changes in the deterrence consequences of the document. I accomplish this by exploiting a reform to the document that occurred in March 2008. The only change that occurred as a result of the reform is the amount of information contained on the document. At this time, the document was changed in a manner such that

the deterrent aspect of the information changed differentially across physicians with differing list prices. Exploiting this difference across providers and examining the within provider use of this document before and after the reform, I show that physician's form use strategies do respond to the deterrence consequences in a manner consistent with the existence of uncertainty in the denial outcome for both patients and physicians, otherwise referred to general uncertainty. Specifically the reform requires physicians to post their prices in the event of non-coverage on the document. Before the reform the deterrence effect of the document was arguably homogeneous and after the reform the deterrence effect is different for physicians with different prices. Examination of changes in within physician document use allows me to control for fixed unobservable physician characteristics that are determinants of form use and are correlated with charge prices.

The predictions of the physician response to this reform are as follows. If it is true that patients and physicians are not fully informed about the chance of denial, then physicians who reveal high prices are more likely to deter patients than physicians who reveal low prices. Since patients cannot predict denial, this deterrence consequence would exist for both patients who would be ex-post accepted and ex-post denied by Medicare, the former of which is more costly to the physician. This implies that physicians with high prices should be less likely to distribute the document after the reform. This also incentivizes physicians to become better at predicting denials. If it is possible for physicians to become better at predicting denials then we should see a reduction in form use for patients who are ex-post accepted. If it is costly for physicians to predict denials, then we should see an indistinguishable reduction in form use across the board

for all patients regardless of the ex-post denial outcome. A competing hypothesis that would lead to a contrary prediction is if patients know for certain that they will not be denied and the charge price will not pertain to them, it could be that the charge price conveys quality. This relationship between price and quality is of much concern to health care experts (see Hussey, Wertheimer, and Mehrotra (2013) and Phillips, Schleifer, and Hagelskamp (2016)). Physicians with high prices would want to reveal their charge prices to patients whose claims will be accepted, since disclosing this price will convey high quality and these patients will know that they will not have to pay it. In this case, we would expect to see physicians with high prices increase their use of the document in response to the reform.

Many theoretical and empirical papers establish the importance of information in determining economic outcomes. Perhaps the most well-known theoretical papers discussing the role of information and the possible market failures that exist without it are Stigler (1961) and Akerlof (1970). Empirical papers have made use of mandatory disclosure policies to estimates the effects of information on outcomes such as price and quality. Papers demonstrating the importance of health care price disclosure include chapter one of this dissertation, Whaley et al. (2014), and Christensen, Floyd, and Maffett (2017). Chernew, Gowrisankaran, and Scanlon (2008) examined the effect of disclosure of hospital quality report cards. Beyond the realm of health care, Jin and Leslie (2003) examine the effects of restaurant quality report cards on restaurant quality. All the aforementioned papers find non-negligible and meaningful results of the effects of information disclosure.

While the importance of information disclosure is well-studied, there are few

empirical papers examining factors that incentivize the voluntary disclosure, or withholding, of information and how reality stacks up against the theoretical predictions of voluntary information disclosure. This is perhaps due to the difficulty in finding data suitable for such a study. Theoretical papers that predict quality disclosure patterns under voluntary disclosure include Grossman (1981), Jovanovic (1982), and Milgrom (1981). The main takeaway is that, under restrictive conditions, suppliers have the incentive to disclose quality information voluntarily since not disclosing will cause consumers to assume low quality. Jin (2004) examines reasons for the failure of this "unravelling" prediction in HMO quality disclosure. She attributes the empirical strategies to differing incentives under varying levels of competition. Lewis (2011) examines the incentive suppliers have to provide pictures on Ebay in order to reduce the burden of asymmetric information on the online goods market. Most of the literature on information disclosure patterns pertain to the disclosure of quality information. Although closely related, one aspect that differentiates this paper from the existing literature is the focus on the voluntary disclosure of price information.

In this paper, I find evidence that uncertainty over precisely the variable that the supposed "informed" party is meant to disclose plays an important role in explaining their disclosure strategies. Particular to the setting, I find evidence that general uncertainty in the denial outcome, and the subsequent consequences of making an ex-post mistake, can explain the surprising information disclosure strategies of physicians. Once physicians have to reveal prices those with 10% higher prices are 1.1 percentage points, or 3.3%, less likely to employ blanket distribution of the document. This result suggests physicians know that patients are deterred when they are shown high prices, and not enticed by supposed

higher quality. Furthermore, I find no evidence that this reduction in form use is concentrated to accepted claims. Indicating that it is very costly for physicians to become informed about the denial outcome within procedure, and they prefer to just stop using the document across the board than resolve the uncertainty in the denial outcome.

From a policy perspective, these results indicate that there can be major difficulties in implementing transparency policies, especially in complex and integrated markets. In this case, physicians themselves do not fully know the information they are supposed to give, and thus their optimal disclosure patterns of blanket distribution or never using the document potentially mitigate the intended purpose of the document. Economists should especially take note of these results since these uncertainties are prevalent and should be considered when modeling patient and physician decision-making. Baicker, Mullainathan, and Schwartzstein (2015) have made important advances in rethinking how we incorporate behavioral mistakes in evaluating the value of medical care into patient decision-making, but more work is necessary to understand how mistakes in calculating the marginal costs of medical enter *both* patient and physician payoffs.

This paper proceeds as follows. Section 2 discusses the Medicare regulation. Section 3 discusses the data. Section 4 presents the empirical analysis. Section 5 provides a discussion of the results, section 6 explains how these results might affect the results found in chapter 1, and section 7 concludes.

2.2 Medicare Part B and the Information Reform

This research will focus on Medicare Part B services between 2007 and 2009. Medicare is the United States' federal insurance program for the elderly. Medicare Part A provides coverage for inpatient procedures and services while Medicare Part B provides coverage for outpatient and non-institutional procedures and services. Together Medicare Part A and Medicare Part B comprise Traditional Medicare. Medicare Part C, or Medicare Advantage, provides the opportunity for a beneficiary to have their Medicare benefits administered by a commercial insurance carrier. Approximately 55 million individuals receive coverage through Medicare. As of 2016, 31% of the Medicare population are enrolled in Medicare Advantage plans according to the Kaiser Family Foundation (2016). This is up from 19% in 2007, which is the time-frame most relevant to this research.

Medicare Part B has cost-sharing components. There is an annual deductible of $150 and a coinsurance rate of 20% above the deductible. This means that even if Medicare covers the claim, there is potential for significant out-of-pocket expense for the patient. Many beneficiaries purchase supplemental coverage to insure against this cost-sharing risk. The Medigap plan is an example of a supplemental policy that protects against the risk of cost-sharing. There are also some beneficiaries who are dual enrolled in Medicaid and Medicare which would also result in more generous coverage. Further still, there are beneficiaries who are also enrolled in a supplemental insurance plan offered by their employer. In chapter one, we discovered that even with many beneficiaries

enrolled in supplemental coverage, beneficiaries respond to information about denial which may not even be relevant to them. This finding further highlights the consequences of such a complicated health care system.

Medicare Part B does not cover all procedures. Reasons a procedure might be denied are that the beneficiary has met the frequency limitations for the procedure or the circumstances under which the procedure is performed do not meet the Medicare standard for medical necessity as determined by Local and National Coverage Determinations. For example, a patient might not have the proper diagnosis, as exhibited by the ICD-9 diagnosis code, that Medicare would expect to see for medical necessity. Medicare is the is the most frequent denier of medical claims, with a denial rate of 4.92% in 2013 according to the American Medical Association's National Health Insurer Report Card as reported by Policy and Medicine (2013).

There are two financial consequences when a procedure is not covered by Medicare Part B or by health insurance in general. First the patient can be held financially responsible for 100% of the bill. This means that deductibles, copays, coinsurance rates, and out-of-pocket maximums no longer apply. Second, and perhaps more burdensome, is that the physician may bill the patient as an uninsured meaning they no longer have to abide by the price set between themselves and the insurance company. This agreed upon price is referred to as the allowed amount or negotiated price. This means that in the event of denial the physician can charge their list price, or charge price, which is what they would charge an uninsured individual. These list prices can be significantly higher than the allowed amount, specifically in the case of Medicare where their allowed amount are protected as being the lowest. Numerous media articles

have documented the wide variation in, and apparent absurdity of, these list prices even within the same local health care market. According to Reinhardt (2006) charge prices across hospitals in California for the same procedure can vary by as much as seventeenfold.

To mitigate the consequences of such financially damaging events, Medicare created a standardized document that Part B physicians can use to inform patients when they think a claim will be denied by Medicare. Notification must be given to the patient by the provider prior to performing the procedure. This notification is achieved by having the patient read and sign a standardized form called the Advance Beneficiary Notice of Noncoverage (ABN). The document serves two functional purposes. First the document serves as a transmittal of information between the physician and patient. The physician is giving an indication to the patient that they believe that the claim will be denied by Medicare, and in the event of this denial, the patient will be responsible for a higher financial liability than if the procedure were covered. The second function is a transfer of liability for the denied claims from the physician to the patient. Herein lies the direct monetary incentive for the physician to use the form. Medicare rules state that in the event of a denial, if there is not an ABN on file, the physician may not seek reimbursement from the patient. When the physician gives this document to the patient, and the patient agrees to go ahead with the procedure, the patient is accepting the financial liability in the event of denial. If the physician does not give the document and the procedure is denied the physician cannot bill the patient and thus assumes financial responsibility for the denial. It is in this sense that the use of the form is not mandatory. If the physician chooses not to use the form, they forgo revenue, but they are

allowed to make that choice. The physician must keep the signed ABN on file and produce it in the event of an audit by Medicare.

The functions of this document ought to be of interest to economists. The information transmittal has demand consequences since it gives the beneficiary a chance to update their beliefs about the utility of the procedure and then decide if they want the procedure performed. A report from the head of family practitioners released by the Office of Management and Budget estimates that as many as one third of the patients choose not to receive medical care after receiving this information (OMB, 2008). The incentives to use (or not use) the document are magnified if the physicians themselves cannot accurately predict denials. If these demand consequences do exist, then there are nontrivial costs and benefits for physicians to use this document that reflect physician preferences, and the patterns of use of this document can shed light on the relative importance of these costs and benefits in explaining physician interaction with patients.

In March 2008, it was announced by the Centers for Medicare and Medicaid Services (CMS) that the document must now list the prices that would be charged in the event of non-coverage. This change affects only the information transmittal function of the document, and it keeps the transfer of liability aspect the same. Heterogeneity in the list price causes heterogeneity in the effect of this increase in information across physicians which I can exploit to better understand physician incentives to disclose information. By seeing how within physician use of the document changes after the reform across providers, we can examine how the consequences of information influence the decision to disclose information. Figure 1.1 of chapter 1 shows the document prior to the change

and figure 1.2 of chapter 1 shows the document after the change. Voluntary use of the new document, instead of the old one, existed between March 2008 and March 2009. Starting in March 2009, the only accepted ABN document was the updated one.

2.3 Data Sources and Summary Statistics

The ideal data for this analysis are administrative claims data along with the filled out and signed ABN forms kept by the physicians. This would ensure that we could see which patients were given the form and their choice of whether to go ahead with the procedure. We would also be able to see which prices were filled in on the document. However given that collection of the documents from a representative number of physicians is infeasible, I have found a way to analyze the use of the document through available data sources.

The main dataset used in the empirical analysis is the 5% carrier claims research identifiable file for 2007 through 2009 which is distributed by CMS. The 5% carrier claims file contains administrative claims information for all the Medicare Part B procedures submitted to Medicare on behalf of 5% of the Medicare beneficiaries. This is approximately 2.5 million beneficiaries. These data contain the unencrypted National Provider Identifier (NPI) of the performing physician, physician location down to the nine digit zip code, health care common procedure codes (HCPCS),[1] procedure modifier codes, diagnosis codes (ICD-9), submitted charges, allowed charges, and Medicare payments. The procedure modifier code is the crucial variable for this analysis. The value

[1]HCPCS codes are Current Procedural Terminology (CPT) codes enhanced to include Medicare specific procedure codes.

"GA" for this variable indicates that the patient was given the ABN form.

To obtain more detail about the patient, I use the 5% CMS enrollment files for years 2007 through 2009. These data contain enrollment, residence, and basic demographic information for the same 5% of the Medicare population that is found in the claim files. For each of these beneficiaries, the enrollment data contain the enrollment date, race, gender, birth date, and the number of months that the premium was paid by the state. This latter variable indicates which of the beneficiaries are dual-eligible for Medicaid since the options for the state to pay the premium is only available for dual-eligibles.

To supplement the Medicare claims data with more detailed information about the physicians, I incorporate physician characteristics from the National Provider Identifier database. The dataset includes variables such as the gender of the physician, and the NPI enumeration date, which can proxy for the experience of the provider.

The main benefit of these data is the large national sample which supports the generality of the results. Also, the size of the data allows for analysis at the procedure level since most procedures are well-represented in the dataset. Procedures vary in meaningful potentially unobserved ways that change economic incentives, thus analysis of procedures separately when feasible is a sound decision. However, as alluded to, there are two main limitations of the dataset for this analysis. First we only see the claims that were submitted to Medicare, and we do not see which patients who were given the document but decided not to get the procedure completed. Thus when we see a fall in the percentage of claims submitted to Medicare with the form modifier, we cannot be sure if this is due to a change in physicians' strategies to distribute the form or a change

in patients' decisions to submit the claim upon receipt of the document. In the empirical analysis I suggest a method for isolating the change in the physician strategies from the patient decisions. The second limitation is that we do no actually see the price that is filled in on the document. However, I do see the charge price on the claim. I infer this as the price that is placed on the document since in the event of denial this is what the physician can charge. Although this may not be the price listed on the form, it serves as an upper bound. Also, as we will see in the empirical work, this submitted charge price is statistically and economically meaningful in predicting use of the ABN document which helps to validate this decision to use it for this analysis.

The crucial variable in this analysis is the procedure modifier code. The value "GA" indicates, and only indicates, that the patient was given the ABN prior to the physician performing the procedure. In this dataset, there are approximately 270 million procedures submitted to Medicare by non-institutional medical providers over the three years. Of these 270 million, approximately 1.5 million have the modifier GA. Table 1.1 of chapter 1 shows the procedures for which this document is most commonly used. For computational feasibility, the table is generated using a 10% random sample of the data. As expected, this document is most used for procedures with relatively high denial rates. Specifically it tends to be used most for preventive procedures and chiropractic procedures.

In the main body of the paper, we will focus on the use of the document for preventive Pap smears, HCPCS code Q0091. This procedure code specifically refers to the collection of the specimen which is then sent to the lab. It does not include the laboratory analysis of the specimen. Furthermore this code

is specific to preventive Pap smears, not diagnostic ones which are performed when the patient is symptomatic. Preventive Pap smears test for abnormalities and are mostly used for the early detection of cervical cancer. Medicare covers preventive Pap smears once every two years for the general population and once every year for patients who are deemed to be high risk. A high risk patient is one who has a history of cervical cancer or has had an abnormal Pap smear in the past three years.

Table 2.1 depicts the summary statistics for Pap smears during the three time periods relevant to the reform. The top panel present summary statistics for claims before the reform. The middle and bottom panel present summary statistics for claims during the voluntary and mandatory use of the new document, respectively. Table 2.2 shows summary statistics for the selected sample of Pap smears that are used for estimation. This selected sample excludes procedures from patients less than 65 years old.[2] Since the empirical analysis will make use of within physician variation in use of the document, I exclude claims from physicians who do not perform at least one procedure in each time period. I also exclude procedures from physicians for whom the NPI data are unavailable.

Turning our attention to the summary statistics for the sample selected for analysis in table 2.2 we see a high denial rate. These preventive Pap smears are denied at a rate of about 34% before the reform with a decline to 30% over time, however even from this table we can see something surprising about the use of the document. While the rate of denial is 34% before the reform, the

[2]It is possible for individuals to obtain Medicare prior to turning age 65 if they have certain illnesses including amyotrophic laterals sclerosis (ALS) and end-stage renal disease (ESRD).

prevalence of the ABN document is even higher at a rate of about 50%. This is our first hint that physician use of this document is not as simple as one would expect. In fact, while the denial rate falls, the use of the document rises. The diagnosis code attached to the procedure indicates whether the claim is from a high risk patient. We see that 6.7% of the procedures are performed on high risk patients. Perhaps as expected, most of these procedures were performed by gynecologists, about 83%. The average allowed amount is $24.91, however this includes all the zeros for claims that were denied. The allowed amount conditional on being accepted is $37.80, which represents the fee that Medicare has set for this procedure. There is slight variation in this amount since certain providers are entitled to more given their specific status as Medicare providers. We also see substantial variation in the charge price which helps the argument that once physicians have to reveal this price, we should expect to see variation in their responses. The mean charge price is $49.67 with a standard deviation of $17.91 and a maximum value of $363.00 before the reform.

2.4 Empirical Analysis of Physician Strategies

In this section I perform empirical analysis to first demonstrate that physician use of this document is not trivial and then demonstrate that their strategies are consistent with the existence of general uncertainty and a deterrence effect. The physician dissemination strategies are presented and discussed in section 2.4.1. The remainder of section 2.4 presents econometric analysis that makes use of the reform to the ABN and within physician variation in dissemination strategies before and after the reform to demonstrate that physicians respond in

a manner consistent with the existence of general uncertainty and a deterrence effect. Specifically in section 2.4.2, I aim to show that once physicians must reveal prices on the document, the physicians with higher prices cut back on their use of the document. In section 2.4.3, I demonstrate that this decrease in form use was not only concentrated on procedures that end up being accepted by Medicare. Physicians cut back their form use for both denied and accepted claims, indicating that the inability to predict denials prevails even when the cost of making a mistake changes.

2.4.1 Physician Strategies

For initial investigation, I first present visual representation of physician strategies for using the document. Specifically, for each physician,[3] I compute what percentage of their procedures are accompanied with the procedure modifier code indicating that the patient received the ABN. Figure 2.1 is a histogram that depicts the distribution of these percentages across physicians that perform preventive pap smears.

We see that there are three striking strategies for using this form. A large percentage of providers never give the document, a large percentage always give the document, and the remaining providers use this document with discretion. These strategies are interesting because they are not consistent with the denial rates. Remember this document should only be distributed when the claim will be denied, so if the denial rates were the same as the form use rate then use of this document would be as expected. Figure 2.2 shows the same histogram as figure 2.1 in the top panel with a histogram of the denial rates in the bottom

[3]I identify distinct physicians by distinct pairs of NPI and five digit zip codes in the dataset.

panel. This is our first indication that use of this document is interesting. If the physicians were using the form as expected then the two histograms should be perfectly aligned.

Figure 2.2 does not allow us to match form use rates to denial rates for a given physician. To see this we turn to figure 2.3 which is a scatter plot of the form use rates and the denial rates. Each point represents the form use rate and denial rate observed for a physician. The scatter plot is weighted by the frequency of physicians located at the form use-denial rate pair. If the physicians were using this form as intended, every point should be on the 45° line. Points above (below) the 45° line indicate that physicians are over (under) using the document. In this simple bivariate scatterplot, we actually see little correlation between the prevalence of the document and the ex-post denial rates.

We have uncovered that some physicians give the document when the claim ends up being accepted by Medicare and that some do not give the document even when the claim ends up being denied by Medicare. The simple two-by-two table 2.3 presents the extent of this finding. We see that of the 113,591 pap smears submitted to Medicare, approximately 34.8% incorrectly had the modifier attached and 15.1% incorrectly did not have the modifier attached. The difference between these two percentages suggest that while physicians err in both directions, the tendency if to err on the side of over-distributing the document instead of under-distributing.

The finding that physicians are both over-using and under-using the document is surprising for a few reasons. First it indicates that physicians are not able to perfect predict denial rates. Since a physician can only receive payment in the event of denial, it makes sense that they would err on the side of giving

the document to protect their revenue. On the other hand, the finding that physicians do not attach the modifier to procedures that end up being denied is shocking because it suggests that physicians are unnecessarily forgoing revenue. However, this too can be explained rationally by physician payoff optimization. First off, there is a direct cost associated with distributing the document. It is predicted that it takes seven minutes on average to give this document and for a patient to read and sign it. This can be time consuming when the average doctor's visit is about sixteen minutes. Another rationalization for underusing the document is the possibility that the form will deter patients from getting the procedure done. Physicians who are altruistic may not want to deter any patients, even those who will be denied because they want them to get the procedure done for medical reasons. Physicians really would not want to deter patients who will be accepted by Medicare, and if they cannot accurately predict denial, this is a real risk. So some physicians might choose to under-use the document to avoid this deterrence aspect. However, if patients know whether their claim will be accepted regardless of receipt of the document, then the deterrence effect should not be important and perhaps it is simply the cost of distributing the form that explains the under-use.

In the following sections I perform empirical analysis that demonstrates the deterrence effect does play an important role in explaining the physician strategies. I show that when the deterrence effect of the document rises, physicians cut back on their use of the document.

2.4.2 Effect on Form Use after Reform

The reform discussed in section 2.2 changed only the deterrence effect of the reform. The reform did nothing to change the administrative function of the document. It simply changed the amount of information put on the document for patients to read. Specifically, after the reform it is mandatory to include prices that would have to be paid in the event of denial on the document. Placing prices on the document makes the deterrence effect higher for physicians with higher prices. If they do in fact care about his deterrence effect, then these physicians should reduce their use of the document. Figure 2.4 shows how the prevalence of the ABN changed over time for different terciles of charge price. The lowest line depicts the highest tercile of charge prices. The first vertical line represents the announcement of the reform, when the use of the new form was voluntary, and the latter vertical line represents the when use of the new form was mandatory. We can see that the prevalence of the form modifier for claims with high charge prices fell after the voluntary use of the new document. Figures 2.5 and 2.6 show the analogous trend restricting the data to claims that are ex-post denied and accepted, respectively. It appears that use of the document fell for both sets of claims, which indicates that even when the costs of the distributing the document rise, physicians do not become better at identifying which claims will be denied. This hints at the potentially high costs of learning this outcome. Although these figures are suggestive that physicians do respond to the deterrence effect by reducing their use of the form, econometric analysis is necessary to control for variables that might confuse the interpretation of these figures. However these figures do show that the trends

in form use across providers with differing prices were similar before the reform, which leads credence to the claim that it inndeed was the reform that caused the subsequent differences between the groups.

In this section, I use the reform and econometric analysis to formally test if physicians with higher prices did indeed reduce their use of the document after the reform relative to physicians with lower prices. It is also possible and likely that physicians might reduce their prices in response to this reform, as demonstrated in chapter 1, thus in the regressions I will use the pre-reform price in the regressions to avoid this issue of simultaneous causality.

The main equation for estimation is:

$$F_{ipt} = G(\beta_0 + \beta_1 V_t + \beta_2 V_t ln(\bar{P}_{p,t=1}) + \beta_3 M_t + \beta_4 M_t ln(\bar{P}_{p,t=1}) + \beta_5 X_i + \delta_p + \nu_{ipt}) \tag{2.1}$$

The outcome variable F_{ipt} is a binary indicator of whether the form modifier appeared on the procedure performed on patient i by physician p in time period t. The vector X_i contains patient characteristics available in this dataset, and δ_p is a physician fixed effect which controls for unobservable physician characteristics that remain constant over time. The inclusion of the physician fixed effect ensures that we are capturing within physician variation in the use of the document. This greatly aids in the interpretation of the results because simple cross-sectional analysis in health care is threatened by differing unobserved demand factors, attitudes towards health, and physician preferences. The variable $\bar{P}_{p,t=1}$ is average submitted charge price, or the list price, of physician, p, before the reform. The equation is estimated with three time periods: before the reform, after the voluntary use of the new document, V_t, and after the mandatory

use of the new document, M_t.

The coefficients β_1 and β_3 pick up changes in form use after the voluntary and mandatory use, respectively. The main coefficients of interest are β_2 and β_4 which capture the heterogeneity in the effect of the reform across differing average list prices. The coefficients β_2 and β_4 capture the effects of the voluntary use of the new document and its mandatory use, respectively. A negative (positive) estimate of these coefficients would imply that physicians use the document less (more) the higher the charge price in response to having to include prices on the document. In the presence of uncertainty over the denial outcome, we would expect these coefficients to be negative implying that high-priced physicians restrain their use of the document relative to low-priced physicians due to their increased probability of deterring a patient from going through with the procedure if they reveal a high price.

Since the outcome variable is binary, the function $G(.)$ captures the appropriate functional transformations to perform analysis. I will not consider the commonly used probit model, since the inclusion of physician fixed effects will cause those results to be biased and/or inconsistent as a result of the incidental parameters problem discussed by Neyman and Scott (1948). Instead I will present the results for a linear probability model which provides ease of interpretation and the results of a conditional logit model as discussed in Chamberlain (1980), which, due to the functional form of the logistic density, does not suffer from the same difficulties encountered using a probit model with fixed effects. The fixed effects logit estimates will result in fewer observations since the estimation procedure cannot include observations from physicians for whom the outcome variable does not change. Thus the physicians who always use and

never use the document over the time frame of the dataset are dropped in the fixed effect logit results. However, by nature this conditional logit procedure does not provide estimates for the fixed effects, only estimates of the β's, thus translation of the coefficients into marginal effects of the probability of success requires assumptions about the values of the fixed effects. It is for this reason that the linear probability model might be more useful for interpretation. This point in favor of the linear probability model with fixed effects is made in Ketcham, Lucarelli, and Powers (2015).

Table 2.4 shows the results of the regression. The first column estimates a linear probability model including physician characteristics in lieu of fixed effects. The second column uses fixed effects. The difference between the two columns highlights the importance of the inclusion of fixed effects. The third and fourth columns are the analogous conditional logit model estimates. The logit results are not the coefficients in the logistic model but rather the marginal effect on the probability of "success" for the outcome variable with all other variables at their mean values. The results are estimated using a 2% Winsorization of the charge prices. This resolves the issue of obvious outliers and mistakes in the data. For example, in one case the submitted charge is suspiciously coded as the same number as the procedure code.

Before turning our attention to the coefficients of most interest, there are other coefficients that are interesting. We see suggestive evidence that physicians are at least partially informed about how to use the document. This is demonstrated by the fact that claims that end up being denied are more likely to have the ABN.[4] This is also demonstrated by the fact that "High Risk" claims

[4]One could argue a reverse causality between the presence of the form modifier and the

are less likely to have the form modifier. A high risk patient is one who has a had a history of cervical cancer or has had an abnormal pap smear in the past three years and thus is able to have the procedure covered by Medicare more frequently than those who general risk. We also see that physicians are less likely to give the document to patients who have more of their annual premium paid by the state, which is only possible if the patient is dual eligible for Medicaid and Medicare. This is informative both about the income level of the patient and the generous insurance coverage held by the patient.

We also see interesting results when we turn our attention to characteristics that capture information about the physician. The variable "Day Since Physician NPI Enumeration Date" is the number of days since the physician was given their National Provider Identifier (NPI) at the date they performed the procedure.[5] It proxies for the experience of the physician. We see that more experienced physicians are more likely to give the document which perhaps indicates that it take time for physicians to learn to use the document which was indicated to me in email exchanges with physicians. Looking at the fixed physician characteristics in columns 1 and 3, we see that use of the document varies significantly by physician specialty. Specifically, gynecologists are much more likely to use the document. This is consistent with the incentive to protect revenue since more of the gynecologists revenue will be driven by such gynecological procedures.

denial outcome. It could be that physicians have a better sense of what will be denied and then distribute the form or it could be that the Medicare administrative contractors (MACs) are more likely to deny when they see the form modifier. At the time of these data, it is expressly stated that denial decisions will not take into account the presence of the form modifier.

[5]This variable is censored because NPIs were given out starting in 2005.

The coefficients of interest appear in the first two rows. Once controlling for physician fixed effects, we see that physicians with high prices reduced their use of the document after the document must include prices. We see that this cutback occurred most prominently after the voluntary use of the new document and with no evidence of changes occurring after the mandatory use of the new document.

As suggested, the results are consistent with the story that physicians respond to the demand consequences and scale back their use of the document when they must reveal prices. However, there is a sample selection issue here to be addressed because it might threaten the validity of the physician behavior story. Since in the Medicare claims dataset, we only observe claims that end up being submitted to Medicare, the sample we have results from both the physician decision to use the document and the patient decision to submit the claim. So it is possible that physicians are not changing their behavior, and that the findings are merely consistent with patients choosing not to submit claims for higher priced procedures. To address this concern, I look at changes in the provider's overall strategy to disseminate information and how that changes after the reform. Specifically, I aggregate the claims for a provider in each period and deem the provider an "Always User" in the period if 100% of their claims have the form modifier. This decision to give the document to every patient most likely physician driven and not patient driven. When we see that all the procedures from a certain physician once had the form modifier and now do not, we can be more certain that this change is a result of the physician's decision to no longer distribute the document to everyone and not merely a change in the patients decision to submit the claim.

For this purpose I estimate the following equation:

$$A_{pt} = G(\beta_0 + \beta_1 V_t + \beta_2 V_t ln(\bar{P}_{p,t=1}) + \beta_3 M_t + \beta_4 M_t ln(\bar{P}_{p,t=1}) + \beta_5 X_{pt} + \delta_p + \nu_{pt}) \tag{2.2}$$

Now there is one observation for each physician in each period. The outcome variable A_{pt} is equal to one if 100% of the claims from physician p in period t have the form modifier.[6] The vector X_{pt} includes average patient variables that vary for physician p over time. The results are presented in table 2.6. The first two columns show the results of a linear probability model and the second two show the results of a conditional logit model. We see evidence corroborating our previous findings and hypothesis that physicians with high prices do find the strategy of over-distributing less attractive after the reform.

One concern that might affect the results is whether some physicians do not know to use the document. This possibility is suggested by the increased form use for physicians with more experience. To address this issue, I check for robustness of the result to the number of claims that a physician submits. In table 2.7 I show the results of equation 2.1 separately for providers with at least 3, 10, and 15 claims over the time frame of the dataset, respectively. The rationale is that large physicians who perform many of these procedures are more likely to be informed about the Medicare rules including the existence of this document. The first three columns present linear probability estimates and the latter three are logit model estimates. Similarly in table 2.8, I present the results of the estimation results of equation 2.2 for physicians with at least 1, 2, and 5 claims in each time period, respectively. We see robustness of the result

[6]This is the large atom of providers at 100% in the histogram

that physicians with higher prices are less likely to use the document after the reform.

2.4.3 Did Physicians Become Better at Predicting Denials?

In the previous section I demonstrated that providers respond to the deterrence consequence by distributing the document less frequently when the deterrence consequences are higher. The question remains whether physicians are getting the form distribution more "correct" after the reform. When the cost of making an ex-post over-use mistake rises one response is for physicians to invest in getting the answer right. To test this hypothesis I run an equation similar to equation 2.1, but the outcome variable is now an indicator of whether or not the physicians got the form use "right", meaning they gave the form and the claim was denied or they did not give the form and the claim was accepted. Referring back to table 2.3, the claims on the diagonal are "right" and the claims off the diagonal are not.

The results of this regression are shown in columns one and three of table 2.9. The columns show the linear probability and conditional logit results, respectively. We see that although physicians cut use of the document as demonstrated by the previous section, they do not seem to get better at getting the answer "right". The probability of making an ex-post mistake is unchanged after the reform. Physicians are not more likely to distribute the reform correctly after the reform. This suggests that physicians decrease their use of the document across the board when the deterrence consequences rise, and that the costs of resolving this uncertainty are potentially high. Recalling that this is a within

procedure analysis, this indicates that perhaps within procedure it is difficult for physicians to decipher which claims will be denied.

To confirm this suggestion, I check whether the decrease in form use is more pronounced for ex-post accepted claims. If physicians are able to predict denials, we would expect that they would reduce their use of the document for procedures that will be accepted by Medicare, because they would not want to deter those procedures more than denied procedures. To check this, I estimate the following enhanced version of equation 2.1.

$$F_{ipt} = G(\beta_0 + \beta_1 V_t + \beta_2 V_t ln(\bar{P}_{p,t=1}) + \beta_3 V_t ln(\bar{P}_{p,t=1}) C_{ipt} + \beta_4 M_t + \beta_5 M_t ln(\bar{P}_{p,t=1}) + \beta_6 M_t ln(\bar{P}_{p,t=1}) C_{ipt} + \beta_7 X_i + \delta_p + \nu_{ipt}) \tag{2.3}$$

This equation tests whether higher priced providers change their use of the document more for accepted (covered) claims, $C_{ipt} = 1$, relative to denied claims.[7] The idea is that if they can predict accepted claims, they should be cutting back form use more for accepted claims. The results are in columns two and four of table 2.9. We do not find evidence that physicians cut back on their use of the document for accepted claims more than for denied claims. These regressions support the previous implication that when the deterrence effect of using the document rises, physicians tend to scale back their use across the board. They do not become better at distributing it accurately. This could imply that the costs of definitively learning who will be accepted and denied are large. Recall that this analysis focuses on a specific procedure, so while physicians might have an idea of what will be denied across different procedures, these results suggest

[7]The estimation of equation 2.3 contains all the interactions of V_t, M_t, $ln(P_{pt})$ and C_{ipt}. These interactions are excluded from the writing of equation 2.3 in the interest of concise presentation.

that they have difficulty when it come to predicting which claims will be denied within procedure.

2.5 Discussion

The findings in this paper support revisiting how uncertainty enters physician decision-making. When it comes to uncertainty over the financial costs of medical care, we have typically thought that the patient is uninformed while the physician is perfectly informed. In this setting, even though Medicare was asking physicians to do something quite simple in warning patients when a claim would be denied, we find that it was actually quite difficult for physicians to implement. This uncertainty physicians face in predicting denials results in extreme notification strategies that could mitigate the purpose of the information. Specifically, some physicians chose to never warn patients about the potential for denial, and some physicians chose to always warn patients about the potential for denial.

The finding that physicians stop using the document liberally when the chance of deterring a patient rises indicates that the physician strategies arise from rational incentives as opposed to random influences. The physicians know that even patients that would be ex-post accepted by Medicare do not know this for certain, and thus if they give them the document they might deter the patients from receiving the care. Thus in order to avoid this loss, physicians with higher deterrence consequences decide to cut back their use of the document. If patients could accurately predict denial or if physicians could accurately convey whether a claim would be denied, then there would be no consequences of

warning patients that they might have to pay for denials when they end up being accepted because they would know that they would be accepted.

Physicians scale back use of this document similarly for both accepted and denied claims. Meaning uncertainty over the probability of denial remains unchanged even after the cost of making a mistake rises. This indicates that the cost of predicting the denials is high. Thus this uncertainty actually results in an unexpected a benefit to some patients. Since the uncertainty causes some physicians to not use the document, these patients who experience denials and do not receive the document are not responsible for payment on the denied claims. Instead the physicians have to bear the cost of these procedures.

For policy purposes, these results highlight the difficulties of notification policies that would require physicians to warn patients about insurance coverage. Such policies are very difficult to implement and make clear in such a complicated health care system. Even though the incentives might be such that physicians are incentivized to get the notifications right, the costs might be prohibitive.

This research also provides insight into why there is substantial price opacity in health care. In this paper we saw that physicians with high charges prices stopped using the document once they had to pre-populate the document with the prices. Thus this research provides evidence that physicians are aware that revealing high prices can deter patients. Patients even respond to information about prices that are not relevant to them, and physicians choose to not reveal the prices in an effort to mitigate these demand responses. The existence of this demand consequence *and* the physicians' strategic response should be considered by policymakers who advocate for increased price transparency in health care.

2.6 Tieback to Chapter One

This paper finds empirical evidence that physicians with higher prices choose to not reveal prices in anticipation of the demand consequences. This speaks to the external validity of the results from chapter 1 which estimated the effects of price transparency on utilization and prices. In chapter 1, we focused on the always users and never users of the document as treatment and control groups, respectively, in a difference-in-differences strategy to estimate the effects of price transparency. I provided suggestive evidence that this method was internally valid since the crucial identification assumption is that the trends in the group would have been the same in absence of the reform.

This difference-in-differences method used in chapter 1 provides an estimate of the treatment effect on the treated. Namely, it provides the effect of price transparency on the always users. The results from chapter 2 indicate that physicians with high prices are more likely to refrain from being always users in anticipation of the demand consequences, and thus this treatment effect on the treated is most likely an underestimate of the effect of price transparency on the utilization at physicians who were not in the treatment group.

In an attempt to adjust the estimated effect from chapter 1 to extrapolate to the physicians not in the treatment group, we turn our attention to the heterogeneity in prices results found in table 1.12 of chapter 1. Using these results a naive calculation of the average treatment effect for all physicians would be the average of the effects for the low, middle, and high tercile price groups. This would yield an estimated average effect of a 5.95% reduction in utilization in response to price transparency. However these price terciles were constructed

using the physicians in the treatment and control groups. Considering now all the physicians in the dataset (not just the Always or Never Users) using these same cutoffs, 27.71% of these physicians would be categorized as having low prices, 38.11% as having middle prices, and 34.18% as having high prices. Taking the heterogeneity results from chapter 1 and using these weights, the extrapolated treatment effect is roughly estimated to be $.2771 \times 1.7\% + .3811 \times -6.4\% + .3418 \times -13.3\% = -6.5\%$. This estimate takes into account the fact that the physicians excluded from the analysis in chapter 1 tend to have higher prices. This is of course a rough extrapolation and ignores differences beyond the price effects that might have caused physicians to not be always users, but it highlights that the results in chapter 1 are arguably a lower bound on the magnitude of the effect of price transparency due to the results in this chapter that physicians withhold price information specifically to avoid the demand consequence.

2.7 Conclusion

This research contributes to the modest empirical literature on voluntary information disclosure strategies. Specifically this research examines disclosure strategies when the distributor of information is not fully-informed. In this paper, I examine how physicians respond to incentives to distribute information warning patients about expected insurance noncoverage. I show that the physician strategies are consistent with general uncertainty over the outcome they are presumed to know. Many physicians employ a blanket strategy of distributing the information to all patients and many physicians choose to never give the

warning.

Furthermore, I find evidence that physicians are aware of the possibility of "scaring off" patients who would be ex-post accepted with this warning. In response to this negative demand consequence, physicians cut back on their dissemination of this warning, however since they are unable to predict who will be denied, they scale back on their use of this warning across the board for all patients. This indicates that for some physicians, the loss in demand of their services outweighs the financial incentive to use the document which mitigates the informational purpose of the document.

The results highlight some of the difficulties of implementing disclosure policies in health care. While targeted information may be the best, there is a trade-off between giving detailed information and knowing the information with certainty. Providers might be unable to accurately predict when an event will trigger an unexpected out-of-pocket expense. This should be taken into account when trying to determine the efficacy of such disclosure policies in complicated markets like health care. Future research that studies the effects of information in the health care market should not assume that physicians are fully-informed but instead should consider how the information disclosure will affect both physician and patient behavior.

2.8 Figures and Tables

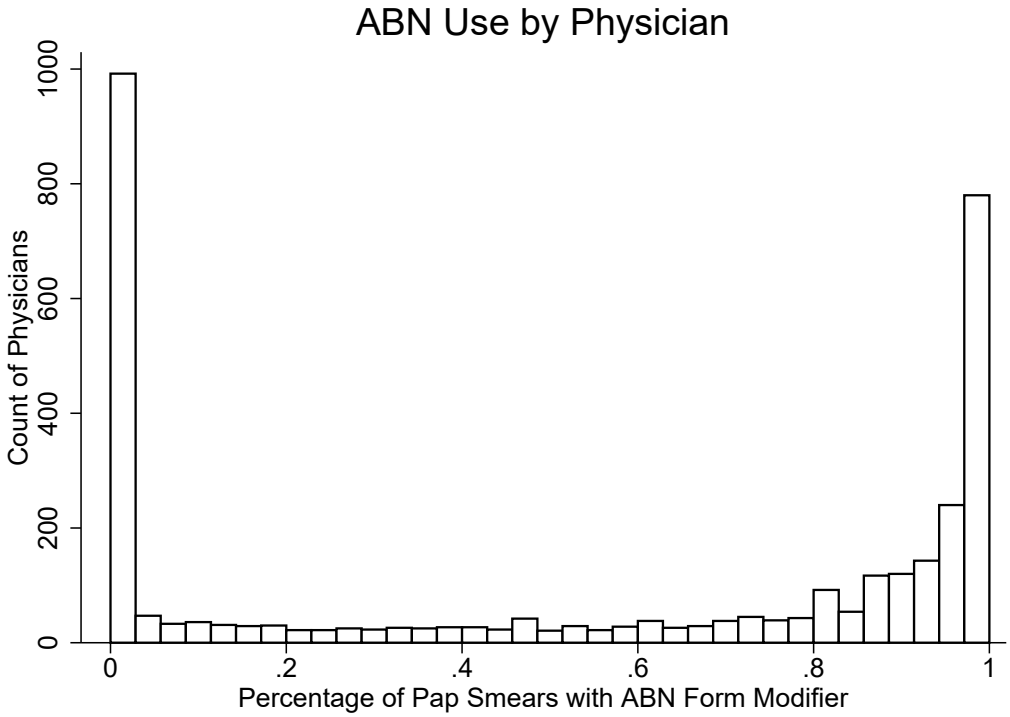
Table 2.1: Procedure Level Summary Statistics - Preventive Pap Smears - All

	mean	sd	min	p1	p99	max	count
Beform Reform							
ABN	0.394	0.49	0.00	0.00	1.00	1.00	90111
High Risk Claim	0.059	0.24	0.00	0.00	1.00	1.00	90111
Patient Age	69.438	10.99	20.00	31.00	89.00	103.00	90111
Patient Black	0.071	0.26	0.00	0.00	1.00	1.00	90111
Months State Paid Premium	1.574	4.00	0.00	0.00	12.00	12.00	90111
Days Since NPI Enumeration	488.549	200.13	0.00	78.00	934.00	1012.00	88421
Submitted Charge Price	51.191	25.36	0.00	12.00	119.00	4500.00	90111
Allowed Amount	24.705	18.34	0.00	0.00	48.30	108.24	90111
Claim Denied	0.334	0.47	0.00	0.00	1.00	1.00	90111
Allowed Amount Given Accepted	37.105	6.72	1.64	14.00	48.43	108.24	59996
Physician Female	0.495	0.50	0.00	0.00	1.00	1.00	87861
Gynecologist	0.681	0.47	0.00	0.00	1.00	1.00	90111
Family Practitioner	0.134	0.34	0.00	0.00	1.00	1.00	90111
Internal Medicine	0.104	0.30	0.00	0.00	1.00	1.00	90111
Participating Physician	0.879	0.33	0.00	0.00	1.00	1.00	90111
During Voluntary Use of New ABN							
ABN	0.396	0.49	0.00	0.00	1.00	1.00	78940
High Risk Claim	0.059	0.24	0.00	0.00	1.00	1.00	78940
Patient Age	68.928	11.19	18.00	30.00	89.00	104.00	78940
Patient Black	0.076	0.27	0.00	0.00	1.00	1.00	78940
Months State Paid Premium	1.645	4.07	0.00	0.00	12.00	12.00	78940
Days Since NPI Enumeration	863.451	202.97	7.00	375.00	1299.00	1375.00	77658
Submitted Charge Price	53.485	35.10	0.00	15.00	133.00	4500.00	78940
Allowed Amount	26.977	18.15	0.00	0.00	49.12	54.11	78940
Claim Denied	0.289	0.45	0.00	0.00	1.00	1.00	78940
Allowed Amount Given Accepted	37.958	6.82	0.01	14.60	49.12	54.11	56103
Physician Female	0.508	0.50	0.00	0.00	1.00	1.00	77637
Gynecologist	0.673	0.47	0.00	0.00	1.00	1.00	78940
Family Practitioner	0.136	0.34	0.00	0.00	1.00	1.00	78940
Internal Medicine	0.101	0.30	0.00	0.00	1.00	1.00	78940
Participating Physician	0.890	0.31	0.00	0.00	1.00	1.00	78940
During Mandatory Use of New ABN							
ABN	0.405	0.49	0.00	0.00	1.00	1.00	65513
High Risk Claim	0.060	0.24	0.00	0.00	1.00	1.00	65513
Patient Age	68.575	11.30	19.00	30.00	89.00	100.00	65513
Patient Black	0.081	0.27	0.00	0.00	1.00	1.00	65513
Months State Paid Premium	1.696	4.11	0.00	0.00	12.00	12.00	65513
Days Since NPI Enumeration	1191.421	210.73	43.00	563.00	1609.00	1681.00	64648
Submitted Charge Price	55.123	22.71	0.00	15.00	140.00	500.00	65513
Allowed Amount	27.244	17.92	0.00	0.00	48.39	51.85	65513
Claim Denied	0.281	0.45	0.00	0.00	1.00	1.00	65513
Allowed Amount Given Accepted	37.898	6.54	0.25	15.00	48.39	51.85	47095
Physician Female	0.517	0.50	0.00	0.00	1.00	1.00	64627
Gynecologist	0.689	0.46	0.00	0.00	1.00	1.00	65513
Family Practitioner	0.128	0.33	0.00	0.00	1.00	1.00	65513
Internal Medicine	0.094	0.29	0.00	0.00	1.00	1.00	65513
Participating Physician	0.909	0.29	0.00	0.00	1.00	1.00	65513

Table 2.2: Procedure Summary Statistics - Preventive Pap Smears for Analysis

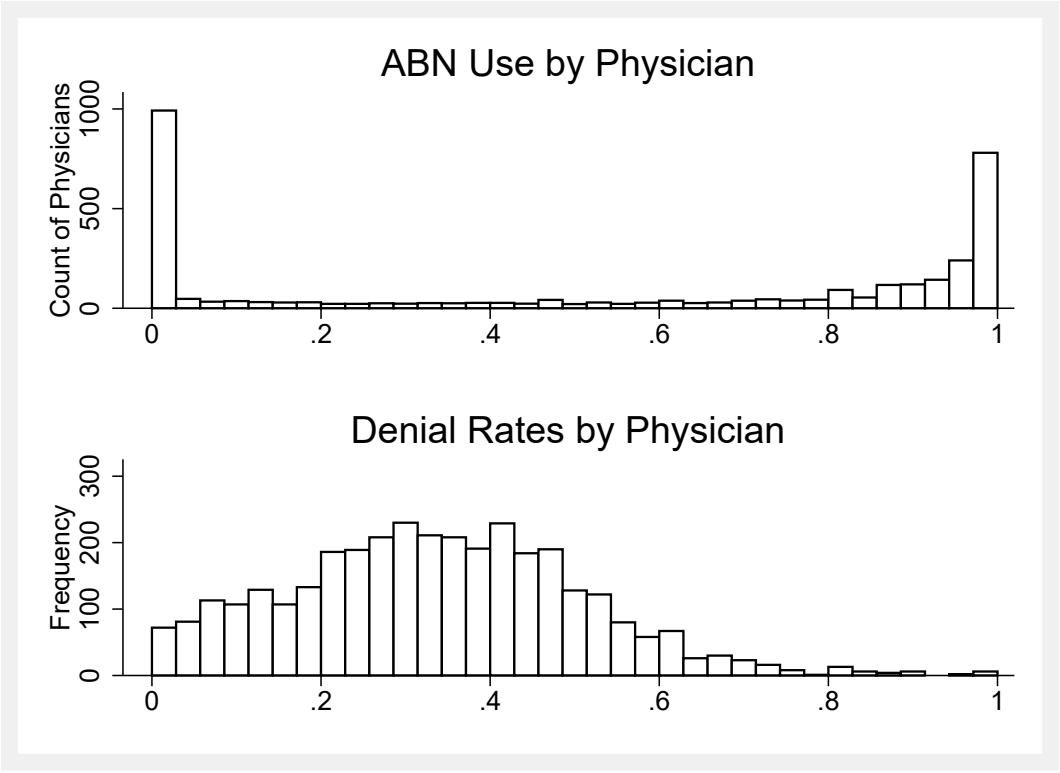
	mean	sd	min	p1	p99	max	count
Before Reform							
ABN	0.498	0.50	0.00	0.00	1.00	1.00	42919
High Risk Claim	0.067	0.25	0.00	0.00	1.00	1.00	42919
Patient Age	73.331	6.16	65.00	65.00	89.00	100.00	42919
Patient Black	0.047	0.21	0.00	0.00	1.00	1.00	42919
Months State Paid Premium	0.616	2.61	0.00	0.00	12.00	12.00	42919
Days Since NPI Enumeration	492.820	201.74	0.00	78.00	939.00	1012.00	42919
Submitted Charge Price	49.667	17.91	0.00	12.00	114.00	363.00	42919
Allowed Amount	24.911	18.66	0.00	0.00	48.30	79.00	42919
Claim Denied	0.341	0.47	0.00	0.00	1.00	1.00	42919
Allowed Amount Given Accepted	37.802	6.43	3.00	13.00	48.98	79.00	28283
Physician Female	0.480	0.50	0.00	0.00	1.00	1.00	42919
Gynecologist	0.826	0.38	0.00	0.00	1.00	1.00	42919
Family Practitioner	0.058	0.23	0.00	0.00	1.00	1.00	42919
Internal Medicine	0.065	0.25	0.00	0.00	1.00	1.00	42919
Participating Physician	0.868	0.34	0.00	0.00	1.00	1.00	42919
During Voluntary Use of New ABN							
ABN	0.518	0.50	0.00	0.00	1.00	1.00	38391
High Risk Claim	0.072	0.26	0.00	0.00	1.00	1.00	38391
Patient Age	73.136	6.19	65.00	65.00	90.00	104.00	38391
Patient Black	0.049	0.22	0.00	0.00	1.00	1.00	38391
Months State Paid Premium	0.575	2.53	0.00	0.00	12.00	12.00	38391
Days Since NPI Enumeration	875.444	196.28	98.00	454.00	1301.00	1375.00	38391
Submitted Charge Price	51.285	18.77	0.00	14.00	114.00	375.00	38391
Allowed Amount	27.326	18.49	0.00	0.00	49.12	54.11	38391
Claim Denied	0.295	0.46	0.00	0.00	1.00	1.00	38391
Allowed Amount Given Accepted	38.755	6.47	1.00	14.00	49.12	54.11	27069
Physician Female	0.490	0.50	0.00	0.00	1.00	1.00	38391
Gynecologist	0.827	0.38	0.00	0.00	1.00	1.00	38391
Family Practitioner	0.056	0.23	0.00	0.00	1.00	1.00	38391
Internal Medicine	0.064	0.25	0.00	0.00	1.00	1.00	38391
Participating Physician	0.886	0.32	0.00	0.00	1.00	1.00	38391
During Mandatory Use of New ABN							
ABN	0.528	0.50	0.00	0.00	1.00	1.00	32281
High Risk Claim	0.072	0.26	0.00	0.00	1.00	1.00	32281
Patient Age	73.029	6.17	65.00	65.00	90.00	100.00	32281
Patient Black	0.052	0.22	0.00	0.00	1.00	1.00	32281
Months State Paid Premium	0.590	2.56	0.00	0.00	12.00	12.00	32281
Days Since NPI Enumeration	1212.740	189.38	425.00	805.00	1611.00	1681.00	32281
Submitted Charge Price	52.606	19.47	0.00	15.00	116.00	375.00	32281
Allowed Amount	27.236	18.41	0.00	0.00	48.39	51.85	32281
Claim Denied	0.297	0.46	0.00	0.00	1.00	1.00	32281
Allowed Amount Given Accepted	38.728	6.08	3.00	15.00	48.39	51.85	22702
Physician Female	0.492	0.50	0.00	0.00	1.00	1.00	32281
Gynecologist	0.830	0.38	0.00	0.00	1.00	1.00	32281
Family Practitioner	0.060	0.24	0.00	0.00	1.00	1.00	32281
Internal Medicine	0.059	0.24	0.00	0.00	1.00	1.00	32281
Participating Physician	0.904	0.29	0.00	0.00	1.00	1.00	32281

Figure 2.1: Distribution of Physician Form Use



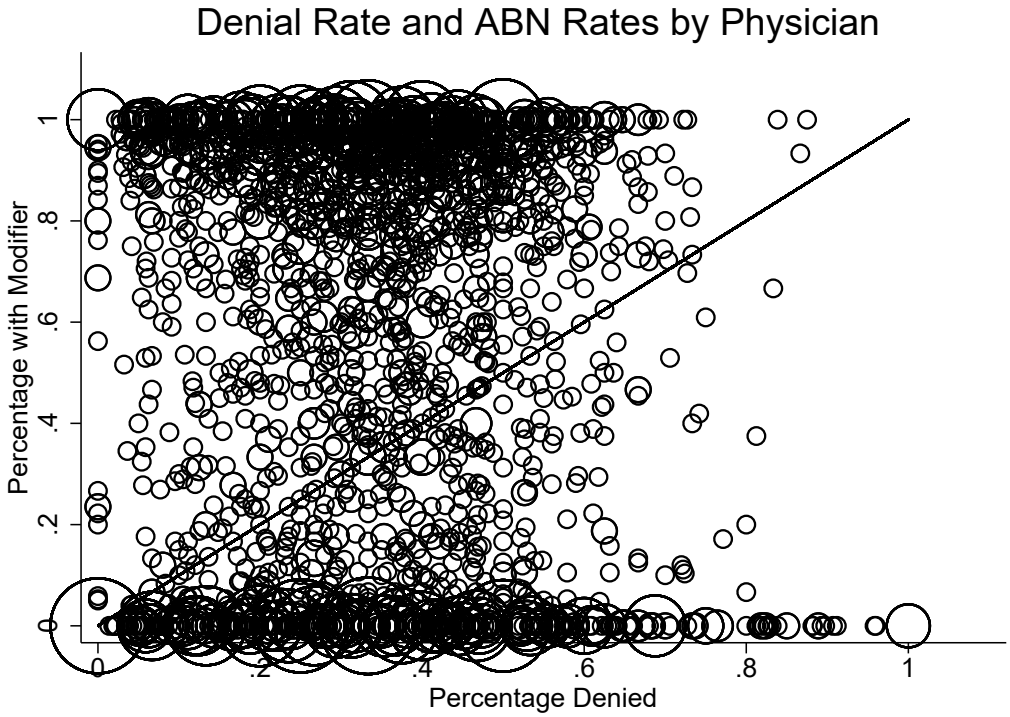
This figure is a histogram of the ABN use across physicians. For each physician, I calculate the percentage of their claims that have the ABN form modifier attached, and this is a histogram representing those percentages. To convince that the atoms near zero and one are legitimate strategies and not artifacts of physicians with a few number of claims, I only include physicians with at least 15 claims in this histogram.

Figure 2.2: Physician Form Use and Denial Rates



These histograms taken together depict that the ABN use and denial rates are not the same as would be expected if physicians were using this document as intended. The top panel is the same histogram presented in figure 2.1. The bottom panel presents a histogram of the denial rates across physicians.

Figure 2.3: Physician Form Use and Denial Rate Pairs



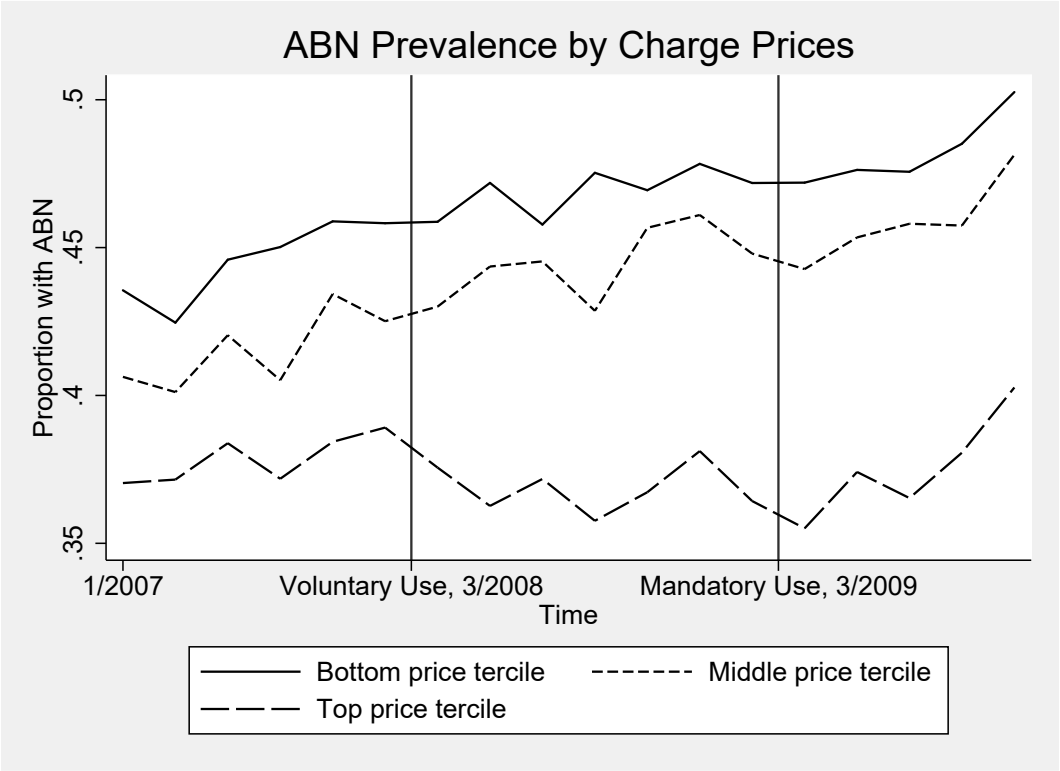
This figure presents a scatterplot of the (denial rate, ABN percentage) pair for each physician. The scatterplot is weighted by the frequency of physicians at the specific location. Points above (below) the 45° line indicate physicians that are over (under) using the document. There also does not appear to be much correlation between the two variables.

Table 2.3: Denial Outcome by ABN Modifier Attached

	ABN		
Claim Denied	No	Yes	Total
No	38,163	39,481	77,644
Yes	17,146	18,801	35,947
Total	55,309	58,282	113,591

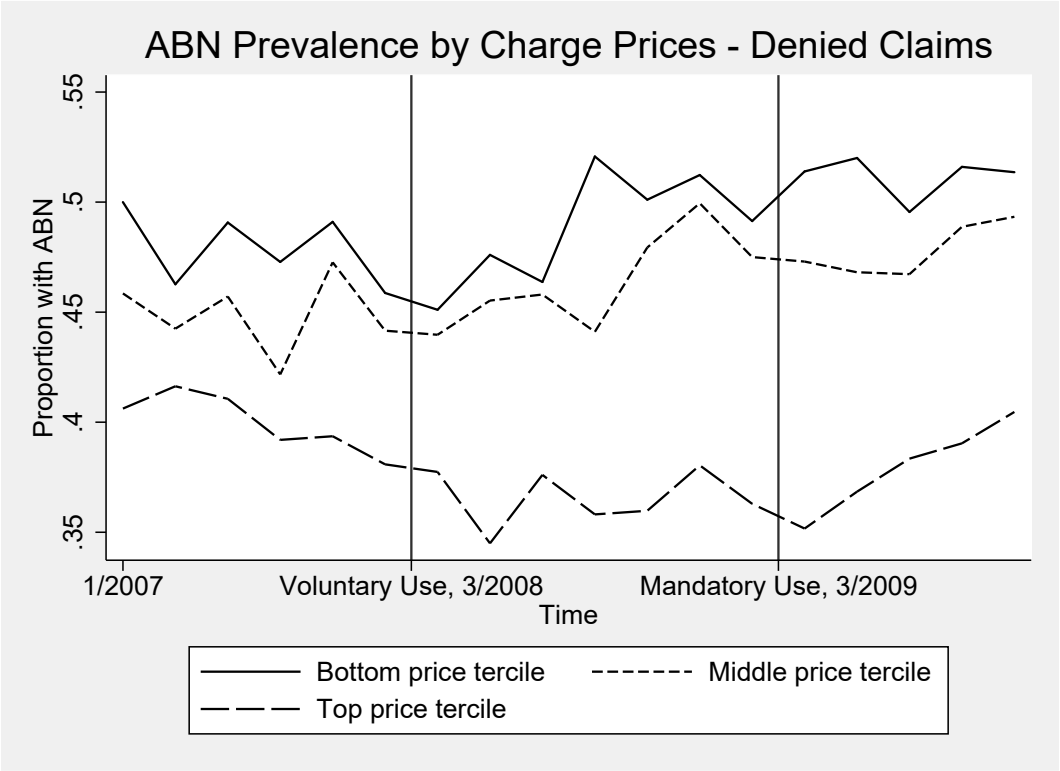
This table shows how accurately the ABN modifier and the denial outcome are aligned. The diagonal terms depict the cases when the ABN modifier was correctly attached (unattached). The off diagonal represent cases where the ABN was either incorrectly used or incorrectly not used.

Figure 2.4: ABN Prevalence by Charge Prices



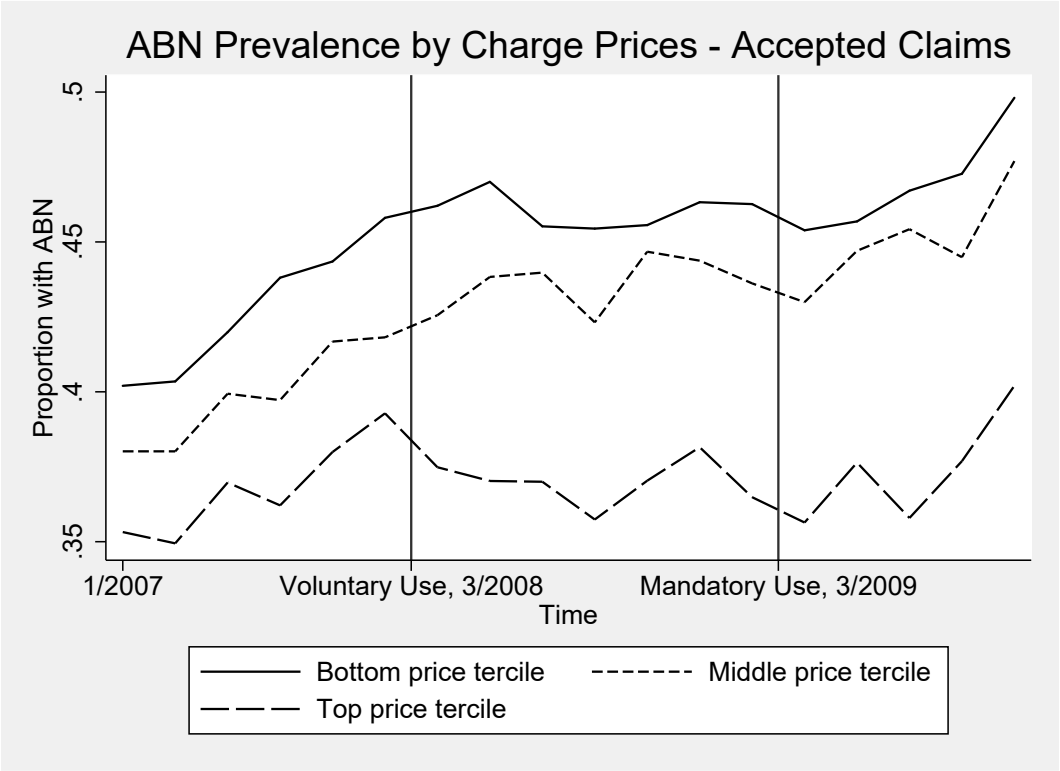
This figure presents a trend in the prevalence of the ABN modifier by charge price terciles. The first vertical line represents the point at which voluntary use of the new document occurred and the second vertical line represents when mandatory use of the new document occurred. We see that after the voluntary use, the prevalence of the form modifier fell for the most expensive claims relative to the less expensive claims.

Figure 2.5: ABN Prevalence by Charge Prices - Denied Claims



This figure presents a trend in the prevalence of the ABN modifier on denied claims by charge price terciles. The first vertical line represents the point at which voluntary use of the new document occurred and the second vertical line represents when mandatory use of the new document occurred. We see that after the voluntary use, the prevalence of the form modifier for denied claims fell for the most expensive claims relative to the less expensive claims.

Figure 2.6: ABN Prevalence by Charge Prices - Accepted Claims



This figure presents a trend in the prevalence of the ABN modifier on accepted claims by charge price terciles. The first vertical line represents the point at which voluntary use of the new document occurred and the second vertical line represents when mandatory use of the new document occurred. We see that after the voluntary use, the prevalence of the form modifier for accepted claims fell for the most expensive claims relative to the less expensive claims.

Table 2.4: Effect of the Reform on Form Prevalence

	(1)	(2)	(3)	(4)
Log(Charge Price) × After Voluntary Price Disclosure	-.003	-.021**	-.002	-.017***
	(.013)	(.009)	(.014)	(.006)
Log(Charge Price) × After Mandatory Price Disclosure	.004	.010	.005	.007
	(.012)	(.009)	(.014)	(.004)
After Voluntary Use	-.008	.086**	-.014	.067***
	(.049)	(.035)	(.057)	(.026)
After Mandatory Use	-.026	-.034	-.033	-.022
	(.048)	(.033)	(.055)	(.017)
Claim Denied	.024***	.007***	.028***	.004***
	(.005)	(.002)	(.006)	(.002)
High Risk Claim	.009	-.020***	.010	-.012***
	(.017)	(.006)	(.019)	(.004)
Patient Age	1.00e-05	.0003*	.00004	.0002**
	(.0003)	(.0002)	(.0004)	(.00007)
Patient Black	-.071***	-.005	-.082***	-.003
	(.012)	(.005)	(.013)	(.003)
Months State Paid Premium	-.014***	-.001***	-.016***	-.001***
	(.001)	(.0004)	(.001)	(.0004)
Log(Days Since Physician NPI Enumeration Date)	.061***	.028***	.071***	.017***
	(.011)	(.005)	(.013)	(.003)
Log(Charge Price)	-.001	.	-.005	.
	(.020)		(.023)	
Physician Female	.015	.	.017	.
	(.012)		(.013)	
Gynecologist	.202***	.	.220***	.
	(.029)		(.034)	
Family Practitioner	-.180***	.	-.232***	.
	(.031)		(.039)	
Internal Medicine	-.250***	.	-.372***	.
	(.031)		(.041)	
Participating Physician	.001	.	-.0002	.
	(.014)		(.016)	
Const.	-.103	.307***	.	.
	(.119)	(.034)		
Obs.	113591	113591	113488	49056
Physician FEs	N	Y	N	Y
R^2	.132	.757	.	.

This table presents the results of equation 2.1 where the outcome variable is a binary indicator of whether a procedure has the ABN form modifier. The first two columns present the results of a linear probability model, where column 1 includes observable physician characteristics, and column 2 includes physician fixed effects. Columns 3 and 4 present the analogous conditional logit results. The conditional logit results report the marginal changes on the probability of success using the mean values of the other variables.

Table 2.5: Physician Summary Statistics - Preventive Pap Smears

	mean	sd	min	p1	p99	max	count
Before Reform							
Procedures Performed	4.645	4.86	1.00	1.00	23.00	80.00	9240
Always User	0.328	0.47	0.00	0.00	1.00	1.00	9240
Percentage Denied	0.299	0.32	0.00	0.00	1.00	1.00	9240
Percent Black	0.052	0.17	0.00	0.00	1.00	1.00	9240
Percent High Risk	0.058	0.18	0.00	0.00	1.00	1.00	9240
Mean Age of Patient	72.885	4.19	65.00	65.00	85.29	99.00	9240
Mean Months Premiums Paid by State	0.667	2.11	0.00	0.00	12.00	12.00	9240
Physician Female	0.500	0.50	0.00	0.00	1.00	1.00	9240
Gynecologist	0.718	0.45	0.00	0.00	1.00	1.00	9240
Family Practitioner	0.113	0.32	0.00	0.00	1.00	1.00	9240
Internal Medicine	0.104	0.31	0.00	0.00	1.00	1.00	9240
Participating Physician	0.866	0.34	0.00	0.00	1.00	1.00	9240
During Voluntary Use of New ABN							
Procedures Performed	4.155	4.21	1.00	1.00	20.00	56.00	9240
Always User	0.363	0.48	0.00	0.00	1.00	1.00	9240
Percentage Denied	0.269	0.32	0.00	0.00	1.00	1.00	9240
Percent Black	0.054	0.18	0.00	0.00	1.00	1.00	9240
Percent High Risk	0.061	0.19	0.00	0.00	1.00	1.00	9240
Mean Age of Patient	72.734	4.26	65.00	65.00	85.00	95.00	9240
Mean Months Premiums Paid by State	0.630	2.11	0.00	0.00	12.00	12.00	9240
Physician Female	0.500	0.50	0.00	0.00	1.00	1.00	9240
Gynecologist	0.716	0.45	0.00	0.00	1.00	1.00	9240
Family Practitioner	0.113	0.32	0.00	0.00	1.00	1.00	9240
Internal Medicine	0.104	0.31	0.00	0.00	1.00	1.00	9240
Participating Physician	0.882	0.32	0.00	0.00	1.00	1.00	9240
During Mandatory Use of New ABN							
Procedures Performed	3.494	3.44	1.00	1.00	17.00	62.00	9240
Always User	0.391	0.49	0.00	0.00	1.00	1.00	9240
Percentage Denied	0.276	0.34	0.00	0.00	1.00	1.00	9240
Percent Black	0.056	0.19	0.00	0.00	1.00	1.00	9240
Percent High Risk	0.060	0.19	0.00	0.00	1.00	1.00	9240
Mean Age of Patient	72.676	4.48	65.00	65.00	86.00	95.00	9240
Mean Months Premiums Paid by State	0.656	2.20	0.00	0.00	12.00	12.00	9240
Physician Female	0.500	0.50	0.00	0.00	1.00	1.00	9240
Gynecologist	0.718	0.45	0.00	0.00	1.00	1.00	9240
Family Practitioner	0.114	0.32	0.00	0.00	1.00	1.00	9240
Internal Medicine	0.104	0.31	0.00	0.00	1.00	1.00	9240
Participating Physician	0.902	0.30	0.00	0.00	1.00	1.00	9240

Table 2.6: Effect on Reform on the Probability a Physician is an Always User

	(1)	(2)	(3)	(4)
Log(Charge Price) × After Voluntary Price Disclosure	-.036**	-.036**	-.110***	-.114***
	(.014)	(.014)	(.039)	(.041)
Log(Charge Price) × After Mandatory Price Disclosure	.011	.011	.044	.045
	(.013)	(.013)	(.039)	(.041)
After Voluntary Use	.175***	.173***	.522***	.537***
	(.055)	(.055)	(.151)	(.157)
After Mandatory Use	-.014	-.013	-.089	-.088
	(.052)	(.052)	(.152)	(.157)
Percentage Denied	.	-.009	.	-.025
		(.008)		(.021)
Percent High Risk	.	-.011	.	-.041
		(.022)		(.053)
Mean Age of Patient	.	-.0002	.	-.0005
		(.0007)		(.002)
Percent Black	.	-.011	.	-.031
		(.018)		(.056)
Mean Months Premiums Paid by State	.	-.002	.	-.005
		(.002)		(.005)
Obs.	27720	27720	7251	7251
Physician FEs	Y	Y	Y	Y
R^2	.751	.751	.	.

This table presents the results of equation 2.2 where the outcome variable is a binary indicator of whether a physician always uses the ABN form modifier. The first two columns present the results of a linear probability model. Columns 3 and 4 present the analogous conditional logit results. The conditional logit results report the marginal changes on the probability of success calculated using the mean values of the other variables.

Table 2.7: Robustness of the Form Use Decision to the Size of the Physician

	(1)	(2)	(3)	(4)	(5)	(6)
Log(Charge Price) × After Voluntary Price Disclosure	-.021**	-.011	-.007	-.017***	-.010**	-.008
	(.009)	(.011)	(.013)	(.006)	(.005)	(.006)
Log(Charge Price) × After Mandatory Price Disclosure	.010	.007	.005	.007	.003	.002
	(.009)	(.011)	(.012)	(.004)	(.004)	(.005)
After Voluntary Use	.086**	.047	.033	.067***	.043**	.035
	(.035)	(.042)	(.051)	(.026)	(.022)	(.023)
After Mandatory Use	-.034	-.022	-.015	-.022	-.008	-.005
	(.033)	(.041)	(.048)	(.017)	(.017)	(.020)
Claim Denied	.007***	.008***	.005	.004***	.004**	.003*
	(.002)	(.003)	(.003)	(.002)	(.002)	(.002)
High Risk Claim	-.020***	-.023***	-.027***	-.012***	-.012***	-.015**
	(.006)	(.007)	(.008)	(.004)	(.005)	(.006)
Patient Age	.0003*	.0001	.0003	.0002**	.00007	.0001*
	(.0002)	(.0002)	(.0002)	(.00007)	(.00007)	(.00008)
Patient Black	-.005	-.004	-.002	-.003	-.003	-.0009
	(.005)	(.005)	(.006)	(.003)	(.003)	(.003)
Months State Paid Premium	-.001***	-.002***	-.002***	-.001***	-.001**	-.0009**
	(.0004)	(.0005)	(.0005)	(.0004)	(.0004)	(.0004)
Log(Days Since Physician NPI Enumeration Date)	.028***	.031***	.030***	.017***	.016***	.016***
	(.005)	(.006)	(.007)	(.003)	(.004)	(.004)
Const.	.307***	.335***	.358***	.	.	.
	(.034)	(.040)	(.046)			
Physician FEs	Y	Y	Y	Y	Y	Y
Obs.	113591	85203	66196	49056	40280	32455
R^2	.757	.748	.748	.	.	.

This table presents the robustness of equation 2.1 to size of the physician. The number of total claims a physician submits is used as an inclusion criteria. Columns 1,2,3 sets the minimum number of claims for inclusion to 3, 10, and 15, respectively. The first three columns are the results from a linear probability model and the last three columns present the results of the analogous conditional logit model. The conditional logit results report the marginal changes on the probability of success calculated using the mean values of the other variables.

Table 2.8: Robustness of the Physician Always User Decision to the Size of the Physician

	(1)	(2)	(3)	(4)	(5)	(6)
Log(Charge Price) × After Voluntary Price Disclosure	-.036**	-.047**	-.099**	-.114***	-.149***	-.294
	(.014)	(.021)	(.044)	(.041)	(.057)	(.271)
Log(Charge Price) × After Mandatory Price Disclosure	.011	.025	-.001	.045	.081	-.012
	(.013)	(.021)	(.039)	(.041)	(.058)	(.107)
After Voluntary Use	.173***	.219***	.423**	.537***	.676***	1.220
	(.055)	(.082)	(.168)	(.157)	(.221)	(1.117)
After Mandatory Use	-.013	-.066	.041	-.088	-.225	.133
	(.052)	(.079)	(.152)	(.157)	(.224)	(.430)
Percentage Denied	-.009	-.024	-.027	-.025	-.059*	-.068
	(.008)	(.016)	(.041)	(.021)	(.035)	(.100)
Percent High Risk	-.011	.002	.022	-.041	.013	.019
	(.022)	(.038)	(.085)	(.053)	(.084)	(.165)
Mean Age of Patient	-.0002	-.0003	-.00005	-.0005	-.0009	-.003
	(.0007)	(.001)	(.003)	(.002)	(.003)	(.006)
Percent Black	-.011	.005	.059	-.031	.048	.071
	(.018)	(.041)	(.123)	(.056)	(.103)	(.269)
Mean Months Premiums Paid by State	-.002	-.001	.008	-.005	-.003	.026
	(.002)	(.003)	(.010)	(.005)	(.009)	(.031)
Physician FEs	Y	Y	Y	Y	Y	Y
Obs.	27720	14025	4047	7251	4086	1227
R^2	.751	.733	.728	.	.	.

This table presents the robustness of equation 2.2 to size of the physician. The number of total claims a physician submits is used as an inclusion criteria. Columns 1, 2, and 3 set the minimum number of claims in a period for inclusion to 1, 2, and 5, respectively for a linear probability model. The last three columns report the analogous results for a conditional logit model. These results report the marginal changes on the probability of success calculated using the mean values of the other variables.

Table 2.9: Effect of Reform on the Probability of Getting the Form Use "Right"

	(1)	(2)	(3)	(4)
Log(Charge Price) × After Voluntary Price Disclosure	-.014	-.024*	.018	-.012
	(.013)	(.015)	(.023)	(.010)
Log(Charge Price) × After Mandatory Price Disclosure	.023	.016	-.0006	.006
	(.014)	(.014)	(.025)	(.006)
Log(Charge Price) × After Voluntary Price Disc × Accepted	.	.005	.	.002
		(.014)		(.006)
Log(Charge Price) × After Mandatory Price Disc × Accepted	.	-.009	.	-.003
		(.015)		(.006)
After Voluntary Use	.056	.096*	-.054	.046
	(.049)	(.057)	(.088)	(.038)
After Mandatory Use	-.083	-.057	.032	-.022
	(.054)	(.055)	(.095)	(.022)
Claim Denied	.073***	.032	.824***	.015**
	(.014)	(.036)	(.038)	(.007)
High Risk Claim	-.038***	-.020***	.001	-.008
	(.011)	(.006)	(.013)	(.005)
Patient Age	.0004*	.0003*	.0001	.0001
	(.0002)	(.0002)	(.0005)	(.00007)
Patient Black	1.00e-05	-.005	.003	-.002
	(.008)	(.005)	(.015)	(.002)
Months State Paid Premium	.0006	-.001***	.002	-.0006
	(.0007)	(.0004)	(.001)	(.0004)
Log(Days Since Physician NPI Enumeration Date)	-.027***	.028***	-.034***	.010*
	(.007)	(.005)	(.013)	(.006)
Const.	.627***	.282***	.	.
	(.045)	(.050)		
Obs.	113591	113591	64583	49056
Physician FEs	Y	Y	Y	Y
R^2	.243	.757	.	.

This table presents the result of equation 2.1 with the outcome variable changed to be a binary indicator of whether the form modifier and the denial rate are consistent with each other. In other words, the outcome of these columns is whether the physician got the form use "right". These results are presented in columns 1 and 3 for a linear probability model and conditional logit model, respectively. Columns 2 and 4 present the results of equation 2.3 for a linear probability model and conditional logit model, respectively. These columns check if the form prevalence fell more for accepted claims than denied claims.

Chapter 3

The Effect of Insurance Coverage Information on Utilization of Health Care for New Medicare Enrollees

3.1 Introduction

The United States' health care system is complicated and patients navigate this system largely uninformed. Health insurance plans are becoming more complex. With the confusion over *what* procedures are covered, *where* the procedures are covered, and *how* much of the procedures are covered, the value in informing patients about aspects of their insurance plans is becoming more apparent. While some may think the value lies in conveying the subtle details of a plan, it is possible that many would benefit from simply learning the basics about how health insurance works. Given the complexity of insurance plans, it is infeasible to supply beneficiaries with full information that would allow them to perfectly predict their medical bills. This necessitates further research to understand

what information is best to give and for whom the information will be the most effective.

In this paper, I examine the effect of receiving notification within the first six months of enrollment that Medicare does not cover all procedures on future utilization of medical care. I exploit the use of a standardized Medicare Part B document created by the Centers for Medicare and Medicaid Services (CMS) that Part B physicians use to warn patients when a procedure may not be covered by Medicare. The physicians are incentivized to use this document because it grants them permission to charge beneficiaries for the full cost of the procedure in the event that Medicare denies (does not cover) the procedure. Even though the document is used to convey the physician's belief about the coverage of a specific procedure, the document does convey simple and salient information about Medicare that beneficiaries might retain when they consider future medical care. Namely the document conveys that Medicare does not provide coverage for all procedures, and the beneficiary has to sign this document indicating their understanding of this information.

The literature has established that individuals do respond to changes in salient insurance coverage characteristics. Examples of this research include the famed Rand Health Insurance Experiment (HIE) which remains the gold standard for establishing the price elasticity of demand for medical care (Manning et al., 1987). More recent work on this topic includes Kowalski (2016) who examines the distribution of price elasticities revealing that there are higher elasticities than the HIE suggest, and Brot-Goldberg et al. (2017) who leverage a recent shift to a high deductible insurance plan at a large self-insured firm.

Even though individuals do respond to changes in insurance coverage characteristics, there is mounting evidence that they are making seemingly suboptimal decisions. For example, Brot-Goldberg et al. (2017) show that even though individuals do respond to the increased deductible, patients reduce both valuable and invaluable care, and that a large percentage of the reduction in care comes from the ex-ante sickest population who experience a low shadow price of care. In the theoretical literature, Baicker, Mullainathan, and Schwartzstein (2015) incorporated the possibility for patient mistakes into a model of medical decision-making. I contribute to this literature by examining how insurance information revelation, while leaving the benefit design the same, can result in similar changes in medical care utilization.

The effect of revealing that insurance does not cover all procedures is unclear. If beneficiaries already know that Medicare does not cover all procedures then there should be no effect. However if beneficiaries do not know this then there are differing possibilities for what may happen. Beneficiaries might take the effort to learn which procedures are covered and thus reduce their consumption of non-covered care. On the other hand, once they realize that Medicare does not cover everything they may find themselves unable to perfectly predict denials and instead they could scale back on both covered and non-covered medical care in an effort to avoid high medical bills. It is also possible that beneficiaries might increase their utilization of medical care in response to this information. Once they realize that physicians will warn them when a claim will be denied, they may have more confidence in going to the doctor resulting in an increase in accepted medical care utilization. Reductions in non-covered medical care could arguably be considered a good thing. Non-covered care is medical care

that CMS has deemed to be medically unnecessary. Thus reductions in this type of care could be seen as reductions in wasteful spending. Changes in the utilization of covered care could be seen as an unintended consequence since the purpose of the document is to warn about the possibility of non-covered care. Reductions in covered care could be seen as especially bad since this would represent an unintended reduction in medically necessary care.

Empirical work is necessary to disentangle these possibilities from one another. The econometric strategy exploits variation in the dissemination of this document across Medicare beneficiaries. The strategy tests whether receipt of this document within the first six months of Medicare enrollment is associated with changes in medical care utilization in the subsequent two years. To assuage concerns about the endogeneity of the dissemination of this document, I control for patient demographic characteristics, state fixed effects, and most importantly, medical care utilization in the first six months using a rich claims dataset.

To further address concerns about endogeneity, I perform two types of supplemental regressions. The first set shows that the estimated effects of the information are indistinguishable from zero for emergency department utilization. This indicates that the control variates adequately account for differences in underlying health status. The second type of regression shows that the same strategy yields no distinguishable effects for Medicare beneficiaries who have been enrolled for five years. We would expect this since these beneficiaries have most likely already learned the information contained in the document. If there were endogeneity between receipt of the document and future utilization, then we would expect to estimate an effect even for this more experienced population.

The results suggest that receiving this warning of non-coverage within the first six months of enrollment is effective in reducing health care spending on average, and the reductions occur in the utilization of non-covered procedures. Specifically, receipt of the notification is associated with a 10.8% decrease in total submitted charges and a 5.0% decrease in total submitted claims on average. This breaks down into a significant 13.8% average decrease in denied charges and a statistically insignificant 6.2% average decrease in accepted amounts.

However, these average associations mask the heterogeneous changes in the utilization of covered procedures. When allowing for the association to vary by demographic characteristics, I find that this notification results in lower accepted medical care for beneficiaries in low income primary care markets and markets with low education levels. These results support the hypothesis that some beneficiaries are unable to predict what will be denied, and they cut back on all types of medical care in order to avoid large medical bills. This negative consequence of the information is concentrated on already disadvantaged populations.

That the negative consequences of this information are borne by the low-income and less-educated populations should give pause to policymakers. This cost likely arises from the fact that this information is only partial, not full, information. The information simply states that Medicare does not cover all procedures, but it does not explicitly make clear when procedures will be covered. This forces the beneficiaries to introduce the probability of denial into their medical care decisions or to pay the cost of figuring out when procedures will be covered. Those who choose the former will inevitably cut back on all medical care, even that which is deemed ex-post necessary. Policymakers should

consider that partial information in this complicated market does have the potential to harm individuals.

The remainder of this paper proceeds as follows. Section 2 discusses Medicare, section 3 discusses the data, section 4 presents the empirical strategy and results, section 5 concludes.

3.2 Medicare Part B and the Information Regulation

Medicare Part B is the setting for this research. Part A is coverage for inpatient hospital stays and Part B provides coverage for non-institutional and non-overnight medical care. The Advance Beneficiary Notice of Noncoverage (ABN) which is discussed in extensive detail in the first two chapters of this dissertation, was created by CMS for Medicare Part B physicians to warn beneficiaries who visit them that Medicare does not cover all procedures. The purpose of this notification is to let beneficiaries know that in the event that Medicare does not cover the procedure, the beneficiary will be liable for the costs. The reason the notification is used for Part B procedures and not Part A is because the document is meant to give beneficiaries a chance to consider whether or not the procedure is necessary. This decision is only feasible in a non-urgent setting.

This document was designed to be procedure specific and created assuming the physician could perfectly predict when Medicare denials would occur. As uncovered in previous chapters, this document is not used as simply as it should be used. The incentives are such that some physicians over-use this document and some physicians under-use this document reflecting their inability to predict

denials and heterogeneity in the associated costs of disseminating this document. What results is variation in receipt of the document by arguably similar patients. Essentially what results is that some beneficiaries go to the doctor's office and receive a document telling them that Medicare does not cover all procedures and other similar patients go to the doctor's office and do not receive this notification. This variation is exploited in this paper to uncover the effects of this warning on the utilization of medical care by these beneficiaries.

3.3 Data

For this research, I use administrative insurance claims data to observe beneficiary medical care utilization, demographic data to capture beneficiary heterogeneity in preference for and ability to pay for medical care, and data containing physician characteristics to control for heterogeneity in beneficiary preference for specific types of medical care. These data taken together allow me to uncover the association between receipt of the notification and future utilization while controlling for current utilization, demographics (reflecting risk and preference), and physician characteristics which might be associated with the dissemination of the notification.

The administrative claims data I use are the 5% research identifiable administrative claims data made available by the Centers for Medicare and Medicaid Services (CMS) from 2007-2009. It provides details about the health insurance claims for a random 5% of Traditional Medicare (Part A and Part B) beneficiaries. This is approximately 2.5 million patients. I use the carrier, outpatient, and MedPAR files to examine non-institutional (Part B) claims, outpatient,

and inpatient claims, respectively. The important utilization variables I see for each claim, are the claim date, procedure codes (HCPCS), procedure modifier codes, the submitted charges, and the Medicare allowed amounts. For the outpatient and inpatient claims I can see which claims resulted from the emergency department.

The claims data provide minimal demographic information about the beneficiary, such as race and age, but they do provide detailed geographic location information. Thus to include a more rich set of demographic information, I merge the Primary Care Service Area (PCSA) definitions into the claims data along with aggregate demographic information for each PCSA. The PCSAs are primary care markets as defined by the Dartmouth Atlas group using the 100% Medicare claims files. The demographic variables available at the PCSA level include, but are not limited to, the mean household income, the percentage of individuals who are college educated, the percentage of individuals who are black, and the percentage of individuals who are female.

The claims data do provide some administrative characteristics about the performing physicians such as the specialty, Medicare participation status, and whether the physician is a group practitioner. Most importantly the claims data include the unencrypted National Provider Identifier (NPI). Thus I enhance our knowledge of the physicians by using this NPI to merge in the NPI database. This database allows us to see the gender of the physician and the enumeration date of the physician which proxies for physician experience.

The goal of this paper is to understand how beneficiaries who are new to Medicare respond to information about coverage, and this motivates the selection of the sample of interest. Given the time frame of the dataset, this

study focuses on Medicare enrollees that enrolled within the first six months of calendar year 2007. I can identify these beneficiaries and their medical claims using the 5% Beneficiary Enrollment file which contains information about the Medicare coverage start dates. This selection is made to ensure that the beneficiaries are relatively new to Medicare and that there is adequate time remaining in the data set to investigate their future utilization. Focusing on this group, I observe each beneficiary for the first two and a half years of their enrollment in Medicare. I use the first six months of enrollment to construct independent variables and the subsequent two years to construct the dependent variables. I also restrict the sample to beneficiaries that enrolled at age 65. This removes individuals who became eligible for Medicare prior to 65 due to end-stage renal disease, ALS, and long-term disability.[1]

The main independent variable of interest is whether the beneficiary received the notification of noncoverage within the first six months of Medicare. In order to have seen this document, the beneficiary would have had to go to a Part B physician, thus the sample is restricted to beneficiaries who had at least one Part B medical claim within the first six months of enrollment. Of these beneficiaries, I identify which ones received the notification using the procedure modifier code. There is a specific procedure modifier code, "GA", which appears in the claims dataset when the beneficiary receives the notification of noncoverage. This modifier code means and only means that the beneficiary received the notification of noncoverage.

In the main body of the paper, I will restrict the sample to males. The analogous results for females are presented in the Appendix. I choose to focus

[1]The results are robust to the inclusion of this group.

on the utilization of males because form use is very highly correlated with the receipt of preventive gynecological procedures. For this group of procedures the notification is used about 40% of the time (the next highest percentage is 17%).[2] The group of females who receive these procedures are arguably a selected sample and the controls do not appear to adequately account for this endogeneity. There is the potential for a similar issue with men, but there is not a similar procedure for males that is such an outlier for notification use as these gynecological procedures for females. After this restriction to males, we are left with a sample of 10,151 individuals.

One caveat to keep in mind is that I only see medical claims submitted to Medicare and not medical care that patients received elsewhere or chose to not submit. Thus there could be individuals who received the notification of noncoverage during a particular doctor's visit but chose not to receive the medical care, and thus they would be coded as not having seen the document. I discuss the potential ramifications of this sample selection issue for the results in section 3.4.3.

3.3.1 Summary Statistics

Table 3.1 presents a summary of the main independent and dependent variables. The top panel summarizes the independent variables constructed using the claims from the first six months of enrollment in Medicare for each of the beneficiaries in the sample. The middle panel summarizes the independent

[2]How the notification affects the delivery of preventive gynecological procedures is discussed in chapters 1 and 2.

demographic variables obtained at the PCSA level. The bottom panel summarizes the dependent variables which are constructed using the claims from the subsequent two years of enrollment in Medicare.

The critical independent variable in table 3.1 is "Received ABN". It is a binary indicator of whether any of the claims from the beneficiary in the first six months of enrollment were accompanied with the procedure modifier code indicating that the beneficiary was given the notification of noncoverage. In the sample, 12.3% of the beneficiaries received this document warning them that Medicare does not cover all procedures. Notice that the minimum number of Part B procedures in the first six months is one, indicating that only beneficiaries who received medical care in the first six months are included in the sample. This is because these are the only beneficiaries for whom it is possible to receive the notification. This focus on beneficiaries who received care within the first six months explains the low percentage of black beneficiaries in the sample since this is conditional on use. This reflects the relatively lower utilization of medical by black individuals on average (see Currie and Gruber (1996) and Dunlop et al. (2002)).

The aim of this paper is to uncover how receipt of this document is associated with future utilization of medical care. The measures of future utilization are found in the bottom panel and are constructed using the medical claims that occur after the first six months of enrollment but before the first two and a half years. This cutoff is due to the time frame of the dataset. The dependent variables reflect the high utilization of medical care by Medicare beneficiaries. The probability that a patient had a Part B claim given that they had one in the first six months is about 95%. The data also reflect the high utilization

of emergency department visits among the elderly population (see Pines et al. (2013), Roberts, McKay, and Shaffer (2008), and Samaras et al. (2010)).

I consider more independent variables as controls for endogeneity between the receipt of the form and the outcome variables. These control variables include demographic variables, utilization variables, and variables characterizing the types of physicians seen the patient. The latter category is to control for heterogeneity in physician preference to use the document. The variable "Average Experience of Physicians" is computed using the number of days since the physician received their NPI. This is a proxy for the experience of the physician, however it is censored since NPIs were only introduced in 2005. We see that the average percentage of female physicians seen by a beneficiary in this group is 12.7%. This number is lower than the national average of the percentage of female physicians for two reasons. First this sample includes males only so certain specialties with high concentrations of female physicians are excluded. Second this number also reflects beneficiary gender preference for physicians (see Kelly (1980) and Kerssens, Bensing, and Andela (1997)). We must also keep in mind that these are claims from 2007 - 2009 when the percentage of female physicians was lower than today.

Another independent variable of interest is the Charlson index. This is a risk adjustment measure accepted and used by practitioners and medical researchers to help to control for underlying differences in propensities to consumer medical care caused by differences in latent health status. This index is calculated by attaching cardinal scores ranging from 0 to 6 to different diagnoses which are identified using the ICD-9 diagnosis codes. The scores are then summed for each beneficiary reflecting the possibility that a beneficiary suffers from more

than one of these diagnoses. This sum is the resulting Charlson Index, and it takes integer values from zero to 25. In this sample, the maximum value we see for this index is 19.

The difference between the "Days Submitted Part B Claim" and "Part B Procedures" reflects the quantity of procedures that are performed in a given medical visit since it is possible that a beneficiary has multiple procedures performed in a single visit to the doctor.

One might notice that the allowed amounts and the denied charges do not sum to the total charges. This is because I do not include the price adjustment (the difference between the charge amount and the Medicare allowed amount for a procedure) in the denied charges. The denied charges are the sum of submitted charges that were flat out denied 100% by Medicare. The allowed amounts is the sum of the total payment the physician is entitled to given the Medicare fee schedule. Thus the difference between the sum of the allowed amounts and the denied charges and the total Part B charges reflects the huge discrepancy between charge prices and Medicare negotiated prices, which is an area garnering much interest among health care researchers.[3]

The variable "Dual Eligible" reflects whether the beneficiary is dual eligible for Medicaid. It is an individual indicator of poverty and is constructed using the number of months that the beneficiary has their Medicare premium paid by the state. Women, those under 65, and those receiving end-of-life care are more likely to be dual-eligible (Medicare Payment Advisory Commission, 2007), which explains the relatively low percentage of dual eligibles in the table.

[3]The variability in charge prices across physicians and geographic regions is another striking feature of the US health care system and is (partially) reflected in the difference between the 99th percentile and the 1st percentile of Part B charges.

3.4 The Association Between Noncoverage Notification and Future Utilization

In this section I examine how receiving the document within the first six months of Medicare enrollment is associated with utilization of medical care in the subsequent two years. In section 3.4.1, I discuss the main equations of interest which are estimated using ordinary least squares and present the estimates in section 3.4.2. In section 3.4.3 I explain the main threats to a causal interpretation of the results and my strategies for supporting this causal interpretation.

3.4.1 Main Strategy

The equation of interest is:

$$Y_{ims} = \beta_0 + \beta_1 A_i + \beta_2 D_i + \beta_3 D_m + \beta_4 U_i + \delta_s + \epsilon_{ims} \tag{3.1}$$

Where Y_{ims} is an outcome variable measuring utilization over the two years of Medicare enrollment after the first six months of enrollment for beneficiary i, residing in PCSA m, in state s. The variable A_i is a binary indicator that takes value one if the beneficiary received the notification of noncoverage in the first six months of enrollment and zero otherwise. Thus the coefficient of interest is β_1. It reflects whether there is a statistically and economically significant difference in future utilization between beneficiaries who receive the noncoverage notification within the first six months and those who do not. The term D_i includes demographic variables for beneficiary i that are available in the claims data. The term D_m includes demographic variables that are aggregated to the PCSA levels. These demographic variables are included to control for correlations between the receipt of the noncoverage document and beneficiary

characteristics. The term U_i includes measures of utilization in the first six months of Medicare enrollment for beneficiary i. These variables are included to control for correlations between receipt of the noncoverage document, underlying health status, and preferences for medical care. The term U_i also includes dummy variables that capture the specialty mix of the physicians seen by the beneficiary. This further controls for beneficiary preference for types medical care and helps to quash endogeneity resulting from certain specialties of physicians being more likely to use the notification of noncoverage. The term δ_s includes state level fixed effects to control for unobserved geographic variation in utilization of medical care. The final term ϵ_{ims} includes unobserved heterogeneity in variables that affect the outcome but are not explicitly included in the equation.

To test for heterogeneity in the association between receipt of the noncoverage notification and future utilization of medical care I estimate the following equation.

$$Y_{ims} = \beta_0 + \beta_1 A_i + \beta_2 A_i \times D_m + \beta_3 D_i + \beta_4 D_m + \beta_5 U_i + \delta_s + \epsilon_{ims} \qquad (3.2)$$

Which is the same as equation 3.1 with the addition of the third term, $\beta_2 A_i \times D_m$. The coefficient β_2 captures whether the association between receipt of the form and future utilization varies by demographic variable D_m. Since this research focuses on the effects of information, the most interesting variables to study for heterogeneous effects are those that capture the beneficiaries ability to internalize and respond to the information. Thus I examine the heterogeneity of the association between information and utilization with respect to education levels and income levels which are only available at the PCSA level.

The outcome variables I examine are measures of total utilization (charges and procedure counts), utilization of accepted medical care, and utilization of denied medical care. The split between accepted and denied medical care indicates how well this document does as curbing denied care which is the intended target verses accepted care which is viewed as medically necessary. Ideally we would like to see changes in the use of denied services and not accepted services. Reductions in accepted services would mean that patients cut back on all types of medical care when they learn that Medicare is perhaps not as generous as they hoped.

Equations 3.1 and 3.2 are estimated using ordinary least squares. I take the natural logarithm of all the outcome variables, less the binary indicators, to mitigate the biases caused by outliers and to aid in the interpretation of the results. For the binary outcomes, I estimate a linear probability model to avoid the inconsistency caused by incidental parameters when including state fixed effects as discussed by Neyman and Scott (1948). Thus most of the coefficients are interpreted as percent changes while the linear probability coefficients are interpreted as percentage point changes. The standard errors in the main results are clustered at the PCSA level to control for correlations in the unobservables within the primary care markets.

3.4.2 Results

Table 3.2 reports the association between receipt of the notification of non-coverage and total utilization of Part B services in the following two years by estimating equation 3.1. The outcome is the natural logarithm of the total Part B charges submitted to Medicare. The coefficient of interest is presented

in the first row and the columns increasingly control for differing levels of covariates. Column one only includes the receipt of the document as a regressor and indicates that receipt of the form is associated with a 51.4% increase in the probability of receiving medical care. The second column further controls for demographic variables. We see that dual eligibles consume more medical care which is a well-known phenomenon likely reflecting their lower monetary marginal cost of medical care. Those who reside in PCSAs with higher mean household incomes consume more medical care even after controlling for prior utilization. However these demographic variables do not greatly change the coefficient of interest which indicates that there is little association between the demographic variables and the receipt of the notification. The third column further controls for prior utilization measures. After controlling for these covariates, the sign of the association changes and the receipt of the document is associated with a 10.3% decrease in the probability of receiving medical care. This coefficient is significant at the 10% level. The sign of the association changes not when we control for demographic variables, but rather when we control for prior utilization measures indicating that there is a positive correlation between receipt of the document and underlying health risk or preference for medical care. The fourth column includes state fixed effects which further depresses the coefficient to -10.8% and improves the statistical significance to the 5% level.

The outcome of total charges is comprised of both the amount of care a patient receives and the prices charged for that care. To attempt to disentangle the two, in table 3.3 I present the same regression equations but with the natural

logarithm of the total number of Part B procedures as the outcome. This removes the variation in the previous utilization measure resulting from variation in prices. We see a similar pattern as in the previous table. After controlling for the most covariates we see that the receipt of the notification of noncoverage is associated with a 5.0% decrease in the total number of procedures received by the beneficiary in the following two years. This is significant at the 10% level.

This outcome of total procedure count is comprised of the number of days a beneficiary receives care and the total number of medical procedures they receive on that day. To try to disentangle these two, in table 3.4 I present the same regression equations but with the natural logarithm of the total number of days that the beneficiary receives Part B medical procedures as the outcome. We see a similar progression in the coefficient of interest culminating in a negative association of 3.5% , but it is not significant in the last column.

To get at a similar question at the use of care versus the intensity, table 3.5 reports the association between receipt of the notification of noncoverage and the probability of submitting a Part B claim in the subsequent two years of enrollment. The outcome is a binary indicator that takes value one if the beneficiary received Part B medical care and zero otherwise. The equation is estimated using ordinary least squares making this a linear probability model. We see a similar progression in the coefficients, and in the final column receipt of the notification is associated with a 1.2 percentage point decrease in the probability of receiving Part B medical care in the following two months which is significant at the 5% level.

The main purpose of the notification is to deter utilization of denied medical care, not the utilization of accepted medical care. To get at whether the

document appears to be effective at achieving this goal, I re-estimate the equations focusing on denied charges and denied procedure counts as the outcomes in tables 3.6 and 3.8, respectively and accepted charges and accepted procedure counts in tables 3.7 and 3.9, respectively. We see that receipt of the document is associated with a 13.8% decrease in denied Part B charges and a 6.8% decrease in denied procedures. We also see that the receipt of the document is associated with a decreases in utilization of allowed medical care (-6.2% for charges and -3.3% for procedure counts), however these decreases are not statistically significant.

In table 3.10 I present the heterogeneity of the results with respect to income of the beneficiary using equation 3.2. The outcomes differ across the columns and are log(total charges), log(total denied charges), log(total allowed charges), log(total procedures), log(denied procedures), and log(accepted procedures), respectively. In columns 1 and 4, we see that the negative association between the receipt of the notification and utilization of Part B medical care is less severe for higher income populations. When we look at columns 3 and 6 we see that this heterogeneity is mostly driven by heterogeneity in the utilization of accepted procedures. This indicates that although on average we saw no significant association between the receipt of the document and utilization of accepted medical care, that there is a significant decrease for low income populations and this decrease is mitigated across the population by the higher income populations.

Table 3.11 presents the heterogeneity of the results with respect to education levels of the beneficiary. We see similar results as we saw for income heterogeneity. Areas with a lower percentage of college educated individuals are more likely to have a negative association between receipt of the document

and utilization of medical care relative to areas with a higher percentage of college educated individuals. We see similar effects on utilization of accepted care as we did in the previous table. For interpretation of these results, consider the mean value for the percentage college graduates which is 11.247. Using the results of column 3, for this level of education the association between receipt of the notification is associated with a 7.6% decrease in accepted charges. If we increase this level of education by 10% to 12.371, then the association becomes -4.3%.

3.4.3 Internal Validity of Causal Inference

In the previous section, we saw that the receipt of the notification is associated with reductions in future utilization of medical care after controlling for covariates that capture demographic, current utilization, and geographic differences across beneficiaries. In this section, I discuss the main threats to a causal interpretation of this association and provide suggestive evidence that they are not material in invalidating a causal interpretation.

As discussed in section 3.3, one threat is a sample selection issue which affects the measurement of the main independent variable. Specifically, we only see claims from beneficiaries that were submitted to Medicare. Importantly, we do not see when a beneficiary received the document and chose to not have the procedure performed. Thus a beneficiary who always turns down the procedure when they receive the document will be coded as not having seen the document, and the main independent variable is understated in a non-random fashion. Working through how this might affect the results, it is most plausible that this issue would result in an overestimation of the effect size since the patients who

choose to get the care done and submit the claim most likely have a higher value for medical care and will show up in the dataset as having seen the document. So we would expected to see a positive correlation between our independent and dependent variables given this source of endogeneity. Since we actually see in the results that the association is negative this complication is not critical.

The main threat to internal validity is selective dissemination of the document. It is possible that the form dissemination decision is endogenous to unobservable beneficiary characteristics that drive utilization. It could be the case that, once controlling for the covariates, physicians are simply giving the document to patients who would receive lower amounts of medical care to begin with. However it makes more sense that physicians would selectively give the document to patients with higher utilization. Physicians who face beneficiaries with a higher taste for medical care should be more likely to use this document, not less, to protect their revenue. This is because these patients are more likely to have denied claims due to exceeding frequency limitations or not meeting the requirements for medical necessity. Indeed, the regression results indicate this upward direction of bias. Physicians appear to give this document more often to patients with higher utilization of medical care all else equal. It is when we control for measures of this prior utilization that we find a negative correlation between the form dissemination and utilization. Again since we find a negative association after controlling for these covariates, this source of endogeneity cannot explain the results. However, it still could be that case that this negative coefficient is overstated, and these results represent a lower bound on the magnitude of the negative effect.

One suggestive test to show that the control covariates are sufficient in controlling for latent underlying differences in health is to test whether there is an association between the receipt of the notification of noncoverage and utilization of emergency department (ED) services. If the form is being disseminated disproportionately to patients with differing unobserved health states conditional on the control variates, then we should see a significant association between the form dissemination and emergency visits. If not, then we should see no association. The idea is that ED use is medically urgent and thus not affected by beliefs about prices. Table 3.12 shows the estimates of equation 3.1 with measures of ED utilization as the outcomes. In column 1, the outcome is a binary indicator if whether the beneficiary had an ED visits in the following two years. We see that although there is a negative association between receipt of the noncoverage document and ED use, the association is not significant. In column 2, the outcome is the natural logarithm of total submitted ED charges for the beneficiary in the following two years. Again, although we see a negative association, the association is not statistically significant indicating no distinguishable difference between the two populations. Table 3.13 show the results of equation 3.2 with ED utilization measures as the outcomes. Columns 1 and 3 show heterogeneity in the effect on the probability of an ED claim and the total ED charges across income levels, respectively. Columns 2 and 4 show heterogeneity in the effect on the probability of and ED claims and the total ED charges across education levels, respectively. We see no evidence of significant associations, except for column 2 where the coefficient is significant at the 10% level.

Another suggestive test to support a causal interpretation is to see how the results change when we focus on more experienced beneficiaries. The idea is

that the correlation between the receipt of the document and future utilization is driven by both the informational transmittal and the selective dissemination of the form. If we focus on experienced beneficiaries, the information transmittal should be negligible since you would expect they would already have learned the information. Thus the remaining correlation should be attributable to the endogenous dissemination of the document. In table 3.14 I present the regression results for equation 3.1 using only beneficiaries who enrolled in the first six months of 2002, five years prior to the sample of interest. We see that for this sample there is no significant association between receipt of the notification and future utilization. This results supports the claim that the covariates adequately control for any selective dissemination of the document and that the negative correlation we are picking up for the new beneficiaries is the effect of the information.

In further support of the causal effect, given burden estimate documents prepared by the Office of Management and Budget concerning this notification (2008), we do know that at least some of the variation in its use is caused by supply side variables such as the monetary and time costs associated with using the document. Not all of the variation in the dissemination of the document is driven solely by patient characteristics. An alternate approach would be to find an appropriate instrument derived from supply side conditions. Ideas for such instruments might include wages for medical secretaries, and instruments for the amount of physical time it takes to disseminate the document. We leave this approach for future research.

3.5 Discussion and Conclusion

This paper made use of a Medicare Part B notification to estimate the association between warning patients that Medicare does not cover all Part B procedures within the first six months of enrollment and future utilization of Part B medical care. The empirical strategy exploited cross-sectional variation in the receipt of this document across Medicare beneficiaries. The main threat to a causal interpretation of the association is selective dissemination of the document by physicians to beneficiaries with unobserved differences in underlying propensity to consume medical care. I control for these differences using measures of prior utilization and the Charlson Index as a risk adjustment. I also show that after controlling for these covariates there is no significant difference in the utilization of ED care, indicating that the covariates adequately control for differences in underlying health status. I also show that this empirical strategy yields no distinguishable effect for more experienced beneficiaries who should not be affected by the information. These secondary results support a causal interpretation of the negative association between the warning of noncoverage and future utilization for new Medicare enrollees.

The empirical results indicate that receipt of this warning is associated with a 10.8% reduction in Part B submitted charges in the subsequent two years of enrollment. This reduction in charges is achieved mostly by a 13.8% reduction in denied charges which is the type of utilization that is targeted by this document. This means that this type of information is successful at reducing potentially unnecessary medical spending. On average utilization of accepted medical care falls, but it is not statistically significant.

Although this information is effective in reducing the utilization of unnecessary medical care, the results also highlight a potential negative consequence of this type of information dissemination. There is suggestive evidence that upon receipt of this document, low income beneficiaries and beneficiaries with low levels of education do reduce their utilization of accepted medical care. The low income results could indicate that these populations are concerned about being hit with a large medical bill so the risk of being denied is not worth it, and they reduce their use of medical care altogether. The education results could indicate that these populations are not able to fully understand the notification and what is covered, and they inadvertently cut back on necessary medical care. The potential for this document to adversely effect these already high risk populations should be of concern to policy makers when considering the implementation of information dissemination in such a complicated system. These results highlight the potential negative consequences of information dissemination that places the burden of decision-making squarely on the shoulders of the patients as discussed in Shomaker and Link (2014).

These results were derived using a sample including only males. To speculate how these results might change for females, I would expect that the average effects of the coverage information on utilization would be dampened for females since there is evidence that they are less able to substitute home care for market medical care as discussed in Sindelar (1982). Thus they may be less likely to be dissuaded from using medical care even when they find out that the costs are higher than they previously thought.

As mentioned, the main limitation of this work is the potential for endogenous information dissemination of the document. Although we took steps to

assuage concerns about this endogeneity, future work should search for supply side instruments that might exogenously shift the use of the document across beneficiaries to definitively estimate the causal effect of this information.

3.6 Tables

Table 3.1: Beneficiary Summary Statistics

	mean	sd	min	p1	p99	max	count
Independent Variables Constructed from First Six Months of Claims							
Received ABN	0.123	0.33	0.00	0.00	1.00	1.00	10151
Demographic Variables							
Black Beneficiary	0.066	0.25	0.00	0.00	1.00	1.00	10151
Non-White & Non-Black Beneficiary	0.045	0.21	0.00	0.00	1.00	1.00	10151
Dual Eligible	0.075	0.26	0.00	0.00	1.00	1.00	10151
Utilization Variables							
Charlson Index	1.695	2.69	0.00	0.00	9.00	19.00	10151
Part B Charges	3107.219	6975.22	0.02	45.17	31693.93	175437.00	10151
Days Submitted Part B Claim	5.847	6.20	1.00	1.00	30.00	80.00	10151
Part B Procedures	17.342	22.97	1.00	1.00	99.00	756.00	10151
Part B Allowed Amounts	1040.752	2332.05	0.00	0.00	8137.06	95358.50	10151
Part B Denied Charges	397.175	1753.04	0.00	0.00	6170.02	54020.07	10151
Inpatient Charges	2436.497	19645.36	0.00	0.00	66363.00	767534.00	10151
Outpatient Charges	2159.007	11656.39	0.00	0.00	40480.26	426408.91	10151
Emergency Department Charges	135.189	655.51	0.00	0.00	2554.00	23462.98	10151
Summary Variables of Physicians Seen							
Average Experience of Physicians	428.344	146.43	0.00	88.38	775.23	892.50	10151
% Female Physicians	0.127	0.25	0.00	0.00	1.00	1.00	10151
% Group Physicians	0.160	0.24	0.00	0.00	0.86	0.95	10151
Independent Demographic Variables from Primary Care Service Areas							
Mean HH Income	56274.584	18886.59	15691.20	27929.73	117822.77	196972.35	10151
Percent College Grad	11.247	5.16	1.13	3.23	26.32	34.07	10151
Percent High School Grad	20.156	6.21	2.87	6.03	34.40	45.29	10151
Dependent Utilization Variables Constructed from Following Two Years of Claims							
Had Part B Visit	0.949	0.22	0.00	0.00	1.00	1.00	10151
Part B Charges	12943.511	22276.84	0.00	0.00	101954.61	488909.16	10151
Part B Procedures	71.927	80.05	0.00	0.00	389.00	1058.00	10151
Days Submitted Part B Claim	24.248	23.53	0.00	0.00	114.00	246.00	10151
Part B Allowed Amounts	4433.466	7456.59	0.00	0.00	33771.47	173526.75	10151
Part B Denied Charges	1158.674	4467.25	0.00	0.00	14158.85	177854.94	10151
Part B Allowed Procedures	64.176	72.16	0.00	0.00	351.00	841.00	10151
Part B Denied Procedures	7.751	16.38	0.00	0.00	69.00	442.00	10151
Had Emergency Department Visit	0.299	0.46	0.00	0.00	1.00	1.00	10151
Emergency Department Charges	573.977	1944.50	0.00	0.00	7839.50	75613.00	10151

Table 3.2: Submitted Part B Charges in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.514***	.503***	-.103*	-.108**
	(.062)	(.062)	(.054)	(.055)
Black Beneficiary	.	-.174*	-.031	-.098
		(.094)	(.090)	(.090)
Non-White & Non-Black Beneficiary	.	-.480***	-.288***	-.257**
		(.127)	(.111)	(.112)
Dual Eligible	.	.468***	.181*	.174*
		(.098)	(.094)	(.095)
Log(Mean Household Income)	.	.416***	.337***	.399***
		(.132)	(.115)	(.130)
Percent College Grad	.	.001	-.0003	.003
		(.009)	(.008)	(.008)
Percent High School Grad	.	-.005	-.008	-.00009
		(.006)	(.005)	(.006)
Charlson Index	.	.	.019**	.021**
			(.009)	(.009)
Log(Part B Charges First Six Months)	.	.	-.256***	-.271***
			(.049)	(.049)
Log(Days with Part B Claim First Six Months)	.	.	.246***	.263***
			(.059)	(.059)
Log(Part B Procedures First Six Months)	.	.	.200***	.192***
			(.060)	(.060)
Log(Part B Allowed Amounts First Six Months)	.	.	.472***	.468***
			(.031)	(.031)
Log(Part B Denied Charges First Six Months)	.	.	-.019**	-.015
			(.009)	(.009)
Log(Inpatient Charges)	.	.	.057***	.058***
			(.012)	(.012)
Log(Outpatient Charges)	.	.	.110***	.111***
			(.006)	(.006)
Log(Emergency Department Charges)	.	.	-.115***	-.113***
			(.015)	(.015)
Average Experience of Physicians in First Six Months	.	.	.0003	.0002
			(.0002)	(.0002)
% Female Physicians First Six Months	.	.	.095	.094
			(.092)	(.090)
% Group Physicians First Six Months	.	.	-.045	.021
			(.126)	(.127)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.005	.013	.251	.267

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total submitted Part B charges for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.3: Part B Procedures in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.419***	.414***	-.051*	-.050*
	(.036)	(.036)	(.029)	(.030)
Black Beneficiary	.	-.159***	-.071	-.115**
		(.055)	(.048)	(.048)
Non-White & Non-Black Beneficiary	.	-.305***	-.184***	-.172***
		(.068)	(.059)	(.061)
Dual Eligible	.	.354***	.161***	.157***
		(.057)	(.052)	(.052)
Log(Mean Household Income)	.	.271***	.206***	.226***
		(.076)	(.061)	(.068)
Percent College Grad	.	.001	-.0003	.0008
		(.005)	(.004)	(.004)
Percent High School Grad	.	-.001	-.004	-.002
		(.003)	(.003)	(.003)
Charlson Index	.	.	.019***	.020***
			(.005)	(.005)
Log(Part B Charges First Six Months)	.	.	-.261***	-.265***
			(.025)	(.025)
Log(Days with Part B Claim First Six Months)	.	.	.189***	.201***
			(.031)	(.032)
Log(Part B Procedures First Six Months)	.	.	.318***	.308***
			(.031)	(.031)
Log(Part B Allowed Amounts First Six Months)	.	.	.233***	.229***
			(.014)	(.014)
Log(Part B Denied Charges First Six Months)	.	.	-.016***	-.014***
			(.005)	(.005)
Log(Inpatient Charges)	.	.	.031***	.032***
			(.007)	(.007)
Log(Outpatient Charges)	.	.	.059***	.061***
			(.004)	(.004)
Log(Emergency Department Charges)	.	.	-.066***	-.066***
			(.009)	(.009)
Average Experience of Physicians in First Six Months	.	.	.0002**	.0002**
			(.00009)	(.00009)
% Female Physicians First Six Months	.	.	.050	.050
			(.047)	(.047)
% Group Physicians First Six Months	.	.	-.085	-.051
			(.069)	(.070)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.011	.021	.329	.344

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of Part B procedures for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.4: Days with a Part B Claim in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.335***	.335***	-.038	-.035
	(.031)	(.031)	(.024)	(.025)
Black Beneficiary	.	-.139***	-.068*	-.098***
		(.044)	(.038)	(.038)
Non-White & Non-Black Beneficiary	.	-.291***	-.170***	-.165***
		(.054)	(.047)	(.049)
Dual Eligible	.	.348***	.155***	.151***
		(.047)	(.041)	(.042)
Log(Mean Household Income)	.	.217***	.156***	.154***
		(.059)	(.047)	(.053)
Percent College Grad	.	.002	.0007	.001
		(.004)	(.003)	(.003)
Percent High School Grad	.	.003	-.001	-.0001
		(.003)	(.002)	(.002)
Charlson Index	.	.	.018***	.019***
			(.004)	(.004)
Log(Part B Charges First Six Months)	.	.	-.206***	-.211***
			(.020)	(.020)
Log(Days with Part B Claim First Six Months)	.	.	.369***	.373***
			(.025)	(.025)
Log(Part B Procedures First Six Months)	.	.	.103***	.101***
			(.024)	(.025)
Log(Part B Allowed Amounts First Six Months)	.	.	.178***	.176***
			(.011)	(.011)
Log(Part B Denied Charges First Six Months)	.	.	-.009**	-.007*
			(.004)	(.004)
Log(Inpatient Charges)	.	.	.028***	.029***
			(.005)	(.005)
Log(Outpatient Charges)	.	.	.053***	.054***
			(.003)	(.003)
Log(Emergency Department Charges)	.	.	-.059***	-.058***
			(.007)	(.007)
Average Experience of Physicians in First Six Months	.	.	.0002***	.0002***
			(.00007)	(.00007)
% Female Physicians First Six Months	.	.	.055	.054
			(.037)	(.037)
% Group Physicians First Six Months	.	.	-.047	-.027
			(.056)	(.056)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.01	.022	.356	.37

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of days that the beneficiary submitted Part B procedures in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.5: Probability of Part B Visit in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.020***	.019***	-.013**	-.012**
	(.006)	(.006)	(.005)	(.005)
Black Beneficiary	.	-.005	.007	.005
		(.009)	(.009)	(.009)
Non-White & Non-Black Beneficiary	.	-.015	-.007	-.004
		(.012)	(.011)	(.011)
Dual Eligible	.	.007	-.002	-.0009
		(.009)	(.009)	(.009)
Log(Mean Household Income)	.	.007	.007	.017
		(.012)	(.011)	(.013)
Percent College Grad	.	.0005	.0004	.0004
		(.0008)	(.0008)	(.0008)
Percent High School Grad	.	.0002	-.0001	.0005
		(.0006)	(.0005)	(.0006)
Charlson Index	.	.	-.001	-.001
			(.0008)	(.0008)
Log(Part B Charges First Six Months)	.	.	-.030***	-.031***
			(.005)	(.005)
Log(Days with Part B Claim First Six Months)	.	.	.015**	.015**
			(.006)	(.006)
Log(Part B Procedures First Six Months)	.	.	.007	.007
			(.006)	(.006)
Log(Part B Allowed Amounts First Six Months)	.	.	.047***	.047***
			(.004)	(.004)
Log(Part B Denied Charges First Six Months)	.	.	-.0006	-.0001
			(.0009)	(.0009)
Log(Inpatient Charges)	.	.	.002*	.002
			(.001)	(.001)
Log(Outpatient Charges)	.	.	.005***	.005***
			(.0005)	(.0005)
Log(Emergency Department Charges)	.	.	-.005***	-.004***
			(.001)	(.001)
Average Experience of Physicians in First Six Months	.	.	9.93e-06	1.00e-05
			(.00002)	(.00002)
% Female Physicians First Six Months	.	.	.004	.004
			(.010)	(.010)
% Group Physicians First Six Months	.	.	.008	.014
			(.012)	(.012)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.0009	.002	.135	.146

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is a binary indicator of whether the beneficiary had a Part B visit in the two years following the initial six months of enrollment, making this a linear probability model. Columns 1 through 4 account for an increasing number of control variables.

Table 3.6: Denied Part B Charges in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.541***	.505***	-.129	-.138*
	(.080)	(.079)	(.079)	(.080)
Black Beneficiary	.	.072	.171	.145
		(.121)	(.122)	(.121)
Non-White & Non-Black Beneficiary	.	-.559***	-.413***	-.478***
		(.150)	(.145)	(.148)
Dual Eligible	.	.461***	.230*	.172
		(.121)	(.121)	(.121)
Log(Mean Household Income)	.	.896***	.715***	.568***
		(.153)	(.144)	(.160)
Percent College Grad	.	-.020*	-.018*	-.009
		(.010)	(.010)	(.010)
Percent High School Grad	.	-.035***	-.033***	-.020**
		(.007)	(.007)	(.008)
Charlson Index	.	.	.032***	.031**
			(.012)	(.012)
Log(Part B Charges First Six Months)	.	.	-.013	-.031
			(.051)	(.052)
Log(Days with Part B Claim First Six Months)	.	.	.207***	.228***
			(.075)	(.075)
Log(Part B Procedures First Six Months)	.	.	.207***	.217***
			(.073)	(.073)
Log(Part B Allowed Amounts First Six Months)	.	.	.070**	.053*
			(.030)	(.030)
Log(Part B Denied Charges First Six Months)	.	.	.092***	.086***
			(.013)	(.013)
Log(Inpatient Charges)	.	.	.042**	.046***
			(.017)	(.017)
Log(Outpatient Charges)	.	.	.075***	.081***
			(.011)	(.010)
Log(Emergency Department Charges)	.	.	-.068***	-.072***
			(.022)	(.022)
Average Experience of Physicians in First Six Months	.	.	-.0001	-.0001
			(.0002)	(.0002)
% Female Physicians First Six Months	.	.	.040	.024
			(.114)	(.114)
% Group Physicians First Six Months	.	.	.036	.012
			(.184)	(.185)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.004	.021	.11	.126

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total denied Part B charges for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.7: Allowed Part B Amounts in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.588***	.578***	-.061	-.062
	(.062)	(.063)	(.051)	(.052)
Black Beneficiary	.	-.392***	-.213**	-.270***
		(.107)	(.093)	(.093)
Non-White & Non-Black Beneficiary	.	-.512***	-.304***	-.282**
		(.136)	(.117)	(.120)
Dual Eligible	.	.451***	.145	.136
		(.106)	(.098)	(.099)
Log(Mean Household Income)	.	.412***	.366***	.424***
		(.142)	(.114)	(.130)
Percent College Grad	.	.0009	-.003	-.002
		(.010)	(.007)	(.008)
Percent High School Grad	.	.003	-.003	.002
		(.006)	(.005)	(.006)
Charlson Index	.	.	.014	.016*
			(.009)	(.009)
Log(Part B Charges First Six Months)	.	.	-.502***	-.511***
			(.048)	(.049)
Log(Days with Part B Claim First Six Months)	.	.	.179***	.183***
			(.058)	(.058)
Log(Part B Procedures First Six Months)	.	.	.254***	.248***
			(.058)	(.058)
Log(Part B Allowed Amounts First Six Months)	.	.	.717***	.712***
			(.030)	(.030)
Log(Part B Denied Charges First Six Months)	.	.	-.027***	-.023**
			(.009)	(.009)
Log(Inpatient Charges)	.	.	.057***	.058***
			(.012)	(.012)
Log(Outpatient Charges)	.	.	.107***	.109***
			(.006)	(.006)
Log(Emergency Department Charges)	.	.	-.109***	-.108***
			(.016)	(.016)
Average Experience of Physicians in First Six Months	.	.	.0003*	.0003*
			(.0002)	(.0002)
% Female Physicians First Six Months	.	.	.064	.062
			(.087)	(.086)
% Group Physicians First Six Months	.	.	-.114	-.062
			(.125)	(.126)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.006	.014	.336	.35

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total allowed Part B amounts for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.8: Part B Denied Procedures in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.239***	.227***	-.066**	-.068**
	(.033)	(.033)	(.032)	(.031)
Black Beneficiary	.	.013	.056	.044
		(.046)	(.046)	(.046)
Non-White & Non-Black Beneficiary	.	-.202***	-.145***	-.158***
		(.057)	(.055)	(.056)
Dual Eligible	.	.194***	.105**	.089*
		(.049)	(.047)	(.046)
Log(Mean Household Income)	.	.356***	.275***	.223***
		(.062)	(.058)	(.065)
Percent College Grad	.	-.005	-.005	-.002
		(.004)	(.004)	(.004)
Percent High School Grad	.	-.008***	-.008***	-.004
		(.003)	(.002)	(.003)
Charlson Index	.	.	.013***	.013***
			(.005)	(.005)
Log(Part B Charges First Six Months)	.	.	-.060***	-.064***
			(.019)	(.019)
Log(Days with Part B Claim First Six Months)	.	.	.073**	.079***
			(.029)	(.029)
Log(Part B Procedures First Six Months)	.	.	.159***	.162***
			(.027)	(.028)
Log(Part B Allowed Amounts First Six Months)	.	.	.029**	.023**
			(.011)	(.011)
Log(Part B Denied Charges First Six Months)	.	.	.046***	.044***
			(.005)	(.005)
Log(Inpatient Charges)	.	.	.019***	.020***
			(.007)	(.007)
Log(Outpatient Charges)	.	.	.030***	.032***
			(.004)	(.004)
Log(Emergency Department Charges)	.	.	-.030***	-.031***
			(.009)	(.009)
Average Experience of Physicians in First Six Months	.	.	1.00e-05	1.46e-08
			(.00008)	(.00008)
% Female Physicians First Six Months	.	.	.065	.059
			(.045)	(.045)
% Group Physicians First Six Months	.	.	-.067	-.073
			(.072)	(.072)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.005	.02	.135	.151

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of denied Part B procedures for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.9: Part B Allowed Procedures in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.446***	.441***	-.034	-.033
	(.038)	(.038)	(.031)	(.031)
Black Beneficiary	.	-.247***	-.149***	-.192***
		(.063)	(.053)	(.053)
Non-White & Non-Black Beneficiary	.	-.340***	-.208***	-.191***
		(.075)	(.065)	(.067)
Dual Eligible	.	.357***	.146***	.144**
		(.062)	(.056)	(.056)
Log(Mean Household Income)	.	.258***	.208***	.251***
		(.082)	(.064)	(.072)
Percent College Grad	.	.0004	-.002	-.003
		(.005)	(.004)	(.004)
Percent High School Grad	.	.001	-.003	-.002
		(.003)	(.003)	(.003)
Charlson Index	.	.	.020***	.021***
			(.005)	(.005)
Log(Part B Charges First Six Months)	.	.	-.331***	-.334***
			(.026)	(.026)
Log(Days with Part B Claim First Six Months)	.	.	.172***	.184***
			(.033)	(.033)
Log(Part B Procedures First Six Months)	.	.	.325***	.313***
			(.032)	(.032)
Log(Part B Allowed Amounts First Six Months)	.	.	.320***	.316***
			(.015)	(.015)
Log(Part B Denied Charges First Six Months)	.	.	-.027***	-.025***
			(.005)	(.005)
Log(Inpatient Charges)	.	.	.032***	.034***
			(.007)	(.007)
Log(Outpatient Charges)	.	.	.065***	.067***
			(.004)	(.004)
Log(Emergency Department Charges)	.	.	-.072***	-.071***
			(.009)	(.009)
Average Experience of Physicians in First Six Months	.	.	.0003***	.0002***
			(.00009)	(.00009)
% Female Physicians First Six Months	.	.	.032	.032
			(.048)	(.048)
% Group Physicians First Six Months	.	.	-.095	-.054
			(.073)	(.074)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	10151	10151	10151	10151
R^2	.011	.02	.364	.378

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of allowed Part B procedures for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table 3.10: Heterogeneity in Results by Income

	(1)	(2)	(3)	(4)	(5)	(6)
Saw ABN in First Six Months	-4.501**	-4.472*	-4.741***	-2.473**	-1.758	-2.699**
	(1.908)	(2.652)	(1.815)	(1.067)	(1.070)	(1.131)
Saw ABN × log(Median HH Income)	.402**	.397	.429***	.222**	.155	.244**
	(.174)	(.243)	(.166)	(.097)	(.098)	(.103)
Black Beneficiary	-.100	.143	-.273***	-.116**	.043	-.193***
	(.090)	(.121)	(.093)	(.048)	(.046)	(.053)
Non-White & Non-Black Beneficiary	-.251**	-.472***	-.276**	-.169***	-.156***	-.187***
	(.112)	(.148)	(.120)	(.061)	(.056)	(.067)
Dual Eligible	.170*	.167	.132	.154***	.087*	.141**
	(.095)	(.121)	(.099)	(.052)	(.046)	(.056)
Log(Mean Household Income)	.351***	.521***	.374***	.200***	.205***	.222***
	(.133)	(.163)	(.133)	(.070)	(.067)	(.073)
Percent College Grad	.003	-.009	-.002	.0008	-.002	-.003
	(.008)	(.010)	(.008)	(.004)	(.004)	(.004)
Percent High School Grad	-.0001	-.020**	.002	-.002	-.004	-.002
	(.006)	(.008)	(.006)	(.003)	(.003)	(.003)
Charlson Index	.021**	.030**	.015*	.020***	.013***	.021***
	(.009)	(.012)	(.009)	(.005)	(.005)	(.005)
Log(Part B Charges First Six Months)	-.271***	-.031	-.511***	-.265***	-.064***	-.334***
	(.049)	(.052)	(.049)	(.025)	(.019)	(.026)
Log(Days with Part B Claim First Six Months)	.261***	.227***	.182***	.201***	.079***	.183***
	(.059)	(.075)	(.059)	(.032)	(.029)	(.033)
Log(Part B Procedures First Six Months)	.194***	.219***	.250***	.309***	.163***	.314***
	(.060)	(.073)	(.059)	(.031)	(.028)	(.032)
Log(Part B Allowed Amounts First Six Months)	.468***	.053*	.712***	.229***	.023**	.316***
	(.031)	(.030)	(.030)	(.014)	(.011)	(.015)
Log(Part B Denied Charges First Six Months)	-.015	.086***	-.024**	-.014***	.044***	-.025***
	(.009)	(.013)	(.009)	(.005)	(.005)	(.005)
Log(Inpatient Charges)	.058***	.046***	.058***	.032***	.020***	.034***
	(.012)	(.017)	(.012)	(.007)	(.007)	(.007)
Log(Outpatient Charges)	.111***	.081***	.109***	.061***	.032***	.067***
	(.006)	(.010)	(.006)	(.004)	(.004)	(.004)
Log(Emergency Department Charges)	-.113***	-.072***	-.107***	-.066***	-.030***	-.071***
	(.015)	(.022)	(.016)	(.009)	(.009)	(.009)
Average Experience of Physicians in First Six Months	.0002	-.0001	.0003*	.0002**	-1.15e-06	.0002***
	(.0002)	(.0002)	(.0002)	(.00009)	(.00008)	(.00009)
% Female Physicians First Six Months	.092	.022	.059	.048	.058	.030
	(.090)	(.114)	(.086)	(.047)	(.045)	(.048)
% Group Physicians First Six Months	.014	.005	-.070	-.055	-.076	-.058
	(.127)	(.185)	(.126)	(.070)	(.072)	(.074)
Coverage Start Month Dummies	Y	Y	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y	Y	Y
State FEs	Y	Y	Y	Y	Y	Y
Obs.	10151	10151	10151	10151	10151	10151
R^2	.268	.126	.35	.344	.151	.379

*10%, **5%, ***1% significance

This table presents the results of equation 3.2 with the interaction variable of interest, D_m, being the median household income in the primary care service area of the beneficiary. The outcomes of columns 1-3 are log(total charges), log(denied charges), and log(allowed charges) for the following two years, respectively. The outcomes of columns 4-6 are log(total procedures), log(denied procedures), and log(allowed procedures) for the following two years respectively.

Table 3.11: Heterogeneity in Results by Education

	(1)	(2)	(3)	(4)	(5)	(6)
Saw ABN in First Six Months	-.424***	-.278	-.414***	-.210***	-.110	-.223***
	(.150)	(.195)	(.140)	(.080)	(.075)	(.083)
Saw ABN × Percent College Grad	.027**	.012	.030***	.014**	.004	.016**
	(.011)	(.015)	(.011)	(.006)	(.006)	(.006)
Black Beneficiary	-.099	.145	-.271***	-.116**	.044	-.192***
	(.090)	(.121)	(.093)	(.048)	(.046)	(.053)
Non-White & Non-Black Beneficiary	-.256**	-.478***	-.281**	-.172***	-.158***	-.191***
	(.111)	(.148)	(.120)	(.060)	(.056)	(.067)
Dual Eligible	.171*	.170	.133	.155***	.089*	.142**
	(.095)	(.121)	(.099)	(.052)	(.046)	(.056)
Log(Mean Household Income)	.400***	.568***	.426***	.227***	.223***	.251***
	(.130)	(.160)	(.130)	(.068)	(.065)	(.072)
Percent College Grad	-.0003	-.010	-.006	-.001	-.003	-.005
	(.008)	(.011)	(.008)	(.004)	(.004)	(.004)
Percent High School Grad	-.0004	-.020**	.001	-.002	-.004	-.002
	(.006)	(.008)	(.006)	(.003)	(.003)	(.003)
Charlson Index	.021**	.031**	.015*	.020***	.013***	.021***
	(.009)	(.012)	(.009)	(.005)	(.005)	(.005)
Log(Part B Charges First Six Months)	-.271***	-.031	-.511***	-.265***	-.064***	-.334***
	(.049)	(.052)	(.048)	(.025)	(.019)	(.026)
Log(Days with Part B Claim First Six Months)	.262***	.228***	.183***	.201***	.079***	.184***
	(.059)	(.075)	(.058)	(.032)	(.029)	(.033)
Log(Part B Procedures First Six Months)	.193***	.218***	.250***	.309***	.163***	.314***
	(.060)	(.073)	(.058)	(.031)	(.028)	(.032)
Log(Part B Allowed Amounts First Six Months)	.468***	.053*	.712***	.229***	.023**	.316***
	(.031)	(.030)	(.030)	(.014)	(.011)	(.014)
Log(Part B Denied Charges First Six Months)	-.015	.086***	-.024**	-.014***	.044***	-.025***
	(.009)	(.013)	(.009)	(.005)	(.005)	(.005)
Log(Inpatient Charges)	.058***	.046***	.058***	.032***	.020***	.033***
	(.012)	(.017)	(.012)	(.007)	(.007)	(.007)
Log(Outpatient Charges)	.111***	.081***	.109***	.061***	.032***	.067***
	(.006)	(.010)	(.006)	(.004)	(.004)	(.004)
Log(Emergency Department Charges)	-.113***	-.072***	-.107***	-.065***	-.030***	-.071***
	(.015)	(.022)	(.016)	(.009)	(.009)	(.009)
Average Experience of Physicians in First Six Months	.0002	-.0001	.0003*	.0002**	-9.15e-07	.0002***
	(.0002)	(.0002)	(.0002)	(.00009)	(.00008)	(.00009)
% Female Physicians First Six Months	.092	.023	.059	.049	.059	.030
	(.090)	(.114)	(.086)	(.047)	(.045)	(.048)
% Group Physicians First Six Months	.017	.010	-.067	-.053	-.073	-.056
	(.127)	(.185)	(.126)	(.070)	(.072)	(.074)
Coverage Start Month Dummies	Y	Y	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y	Y	Y
State FEs	Y	Y	Y	Y	Y	Y
Obs.	10151	10151	10151	10151	10151	10151
R^2	.268	.126	.35	.344	.151	.379

*10%, **5%, ***1% significance

This table presents the results of equation 3.2 with the interaction variable of interest, D_m, being the percent of individuals that are college graduates in the primary care service area of the beneficiary. The outcomes of columns 1-3 are log(total charges), log(denied charges), and log(allowed charges) for the following two years, respectively. The outcomes of columns 4-6 are log(total procedures), log(denied procedures), and log(allowed procedures) for the following two years respectively.

Table 3.12: Emergency Department Utilization in Following Two Years

	(1)	(2))
Saw ABN in First Six Months	-.011	-.093
	(.013)	(.092)
Black Beneficiary	.034**	.334***
	(.017)	(.121)
Non-White & Non-Black Beneficiary	-.074***	-.529***
	(.018)	(.130)
Dual Eligible	.115***	.983***
	(.018)	(.133)
Log(Mean Household Income)	.040*	.344**
	(.022)	(.159)
Percent College Grad	-.001	-.008
	(.001)	(.010)
Percent High School Grad	.0006	.002
	(.001)	(.008)
Charlson Index	.003*	.027**
	(.002)	(.013)
Log(Part B Charges First Six Months)	-.023***	-.159***
	(.007)	(.049)
Log(Days with Part B Claim First Six Months)	.005	.073
	(.011)	(.076)
Log(Part B Procedures First Six Months)	.023**	.162**
	(.010)	(.069)
Log(Part B Allowed Amounts First Six Months)	.008**	.046*
	(.004)	(.026)
Log(Part B Denied Charges First Six Months)	-.0007	-.006
	(.002)	(.013)
Log(Inpatient Charges)	.057***	.416***
	(.003)	(.020)
Log(Outpatient Charges)	.089***	.611***
	(.001)	(.010)
Log(Emergency Department Charges)	-.072***	-.489***
	(.004)	(.026)
Average Experience of Physicians in First Six Months	-8.46e-06	-.00007
	(.00003)	(.0002)
% Female Physicians First Six Months	.014	.068
	(.016)	(.113)
% Group Physicians First Six Months	.006	.115
	(.026)	(.189)
Coverage Start Month Dummies	Y	Y
Physician Specialty Mix	Y	Y
State FEs	Y	Y
Obs.	10151	10151
R^2	.309	.308

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome of column 1 is a binary indicator of whether the beneficiary had an emergency department (ED) visit in the two years following the initial six months of enrollment. The outcome of column 2 is the natural logarithm of the total ED charges submitted in those same two years.

Table 3.13: Heterogeneous Associations with ED Visits in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	-.192	-.048*	-1.217	-.323
	(.424)	(.029)	(3.073)	(.213)
Saw ABN × log(Median HH Income)	.017	.	.103	.
	(.039)		(.281)	
Saw ABN × Percent College Grad	.	.003	.	.020
		(.002)		(.017)
Black Beneficiary	.034**	.034**	.333***	.333***
	(.017)	(.017)	(.121)	(.121)
Non-White & Non-Black Beneficiary	-.073***	-.074***	-.528***	-.528***
	(.018)	(.018)	(.130)	(.130)
Dual Eligible	.114***	.114***	.981***	.980***
	(.018)	(.018)	(.133)	(.133)
Log(Mean Household Income)	.038*	.040*	.332**	.345**
	(.023)	(.022)	(.162)	(.159)
Percent College Grad	-.001	-.002	-.008	-.011
	(.001)	(.001)	(.010)	(.010)
Percent High School Grad	.0006	.0006	.002	.002
	(.001)	(.001)	(.008)	(.008)
Charlson Index	.003*	.003*	.027**	.027**
	(.002)	(.002)	(.013)	(.013)
Log(Part B Charges First Six Months)	-.023***	-.023***	-.159***	-.159***
	(.007)	(.007)	(.049)	(.049)
Log(Days with Part B Claim First Six Months)	.005	.005	.072	.072
	(.011)	(.011)	(.076)	(.076)
Log(Part B Procedures First Six Months)	.023**	.023**	.163**	.163**
	(.010)	(.010)	(.069)	(.069)
Log(Part B Allowed Amounts First Six Months)	.008**	.008**	.046*	.046*
	(.004)	(.004)	(.026)	(.026)
Log(Part B Denied Charges First Six Months)	-.0007	-.0007	-.006	-.007
	(.002)	(.002)	(.013)	(.013)
Log(Inpatient Charges)	.057***	.057***	.416***	.416***
	(.003)	(.003)	(.020)	(.020)
Log(Outpatient Charges)	.089***	.089***	.611***	.611***
	(.001)	(.001)	(.010)	(.010)
Log(Emergency Department Charges)	-.072***	-.072***	-.489***	-.489***
	(.004)	(.004)	(.026)	(.026)
Average Experience of Physicians in First Six Months	-8.59e-06	-9.29e-06	-.00007	-.00007
	(.00003)	(.00003)	(.0002)	(.0002)
% Female Physicians First Six Months	.013	.013	.067	.066
	(.016)	(.016)	(.113)	(.113)
% Group Physicians First Six Months	.006	.005	.113	.112
	(.026)	(.026)	(.189)	(.189)
Coverage Start Month Dummies	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y
State FEs	Y	Y	Y	Y
Obs.	10151	10151	10151	10151
R^2	.309	.309	.308	.308

*10%, **5%, ***1% significance

This table presents the results of equation 3.2 where the outcomes are a binary indicator of whether the beneficiary had an ED visit (columns 1 and 2) and the log(total ED charges) (columns 3 and 4) in the two years following the initial six months of enrollment. Column 1 and 3 present heterogeneity with respect to income and columns 2 and 4 present heterogeneity with respect to education level.

Table 3.14: Associations for Experienced Medicare Beneficiaries

	(1)	(2)	(3)	(4)	(5)	(6)
Saw ABN in First Six Months	-.042	-.018	-.014	.003	-.005	.010
	(.043)	(.073)	(.042)	(.025)	(.030)	(.026)
Black Beneficiary	-.127	-.006	-.195**	-.079*	.034	-.128***
	(.081)	(.110)	(.082)	(.046)	(.044)	(.048)
Non-White & Non-Black Beneficiary	.011	-.045	.004	-.012	-.041	-.009
	(.097)	(.151)	(.092)	(.051)	(.056)	(.053)
Dual Eligible	-.008	-.116	-.002	.051	-.003	.050
	(.080)	(.114)	(.080)	(.046)	(.044)	(.048)
Log(Mean Household Income)	.418***	.369**	.437***	.275***	.151**	.304***
	(.100)	(.158)	(.096)	(.058)	(.062)	(.060)
Percent College Grad	-.008	.002	-.004	-.005	-.001	-.004
	(.006)	(.010)	(.006)	(.003)	(.004)	(.004)
Percent High School Grad	-.009*	-.027***	-.002	-.004	-.011***	-.002
	(.005)	(.007)	(.005)	(.003)	(.003)	(.003)
Charlson Index	.018***	.032***	.018***	.023***	.020***	.023***
	(.006)	(.011)	(.006)	(.004)	(.004)	(.004)
Log(Part B Charges First Six Months)	-.301***	-.044	-.601***	-.289***	-.066***	-.372***
	(.041)	(.052)	(.037)	(.021)	(.019)	(.021)
Log(Days with Part B Claim First Six Months)	.174***	.364***	.103**	.141***	.128***	.108***
	(.049)	(.074)	(.047)	(.027)	(.029)	(.028)
Log(Part B Procedures First Six Months)	.207***	.213***	.216***	.373***	.192***	.363***
	(.052)	(.074)	(.049)	(.028)	(.029)	(.029)
Log(Part B Allowed Amounts First Six Months)	.500***	-.023	.888***	.258***	-.011	.392***
	(.037)	(.036)	(.034)	(.017)	(.014)	(.017)
Log(Part B Denied Charges First Six Months)	-.003	.116***	-.006	-.010**	.050***	-.019***
	(.007)	(.012)	(.007)	(.004)	(.005)	(.004)
Log(Inpatient Charges)	.034***	.028*	.033***	.020***	.017***	.020***
	(.010)	(.015)	(.010)	(.006)	(.006)	(.006)
Log(Outpatient Charges)	.071***	.071***	.068***	.042***	.028***	.045***
	(.005)	(.009)	(.004)	(.003)	(.004)	(.003)
Log(Emergency Department Charges)	-.095***	-.082***	-.090***	-.058***	-.032***	-.061***
	(.014)	(.021)	(.014)	(.008)	(.009)	(.008)
Average Experience of Physicians in First Six Months	.0002	.0001	.0002*	.0001	.00003	.0001
	(.0001)	(.0002)	(.0001)	(.00008)	(.00008)	(.00008)
% Female Physicians First Six Months	.032	.125	.040	.034	.054	.030
	(.078)	(.114)	(.073)	(.043)	(.043)	(.044)
% Group Physicians First Six Months	.122	.067	.163	-.007	-.127*	.044
	(.105)	(.170)	(.100)	(.060)	(.066)	(.063)
Coverage Start Month Dummies	Y	Y	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y	Y	Y
State FEs	Y	Y	Y	Y	Y	Y
Obs.	10668	10668	10668	10668	10668	10668
R^2	.28	.142	.4	.386	.184	.424

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 when only beneficiaries who enrolled in Medicare in the first six months of 2002 are considered. The outcomes of columns 1-3 are log(total charges), log(denied charges), and log(allowed charges) for the following two years, respectively. The outcomes of columns 4-6 are log(total procedures), log(denied procedures), and log(allowed procedures) for the following two years, respectively.

Appendix A

Appendix for Chapter 3

A.1 Results for Females

In this appendix, I present the analogous tables from chapter 3 for females who enrolled in Medicare at age 65 within the first six months of 2007. I do not focus on this group in the main body of the paper because of the extreme use of the notification of noncoverage for gynecological visits. The propensity of certain types of females to get these procedures skews the independent variable in ways that do not seem to be adequately controlled for by the inclusion of variables representing utilization of gynecological services. However, it could be the case that females simply do not respond to this information.

Table A.1: Beneficiary Summary Statistics

	mean	sd	min	p1	p99	max	count
Independent Variables Constructed from First Six Months of Claims							
Received ABN	0.181	0.38	0.00	0.00	1.00	1.00	14312
Demographic Variables							
Black Beneficiary	0.078	0.27	0.00	0.00	1.00	1.00	14312
Non-White & Non-Black Beneficiary	0.048	0.21	0.00	0.00	1.00	1.00	14312
Dual Eligible	0.104	0.31	0.00	0.00	1.00	1.00	14312
Utilization Variables							
Charlson Index	1.356	2.45	0.00	0.00	9.00	19.00	14312
Part B Charges	3074.757	7161.09	9.63	55.00	27543.64	248246.02	14312
Days Submitted Part B Claim	6.660	6.53	1.00	1.00	32.00	81.00	14312
Part B Procedures	18.984	22.99	1.00	1.00	109.00	487.00	14312
Part B Allowed Amounts	1048.844	2250.06	0.00	0.00	7648.42	93772.42	14312
Part B Denied Charges	390.596	1846.12	0.00	0.00	5750.00	81781.00	14312
Inpatient Charges	1671.756	15324.52	0.00	0.00	45404.00	521950.00	14312
Outpatient Charges	2258.748	11535.07	0.00	0.00	39750.12	524017.84	14312
Emergency Department Charges	111.401	463.67	0.00	0.00	2249.00	9081.25	14312
Summary Variables of Physicians Seen							
Average Experience of Physicians	425.374	138.32	0.00	104.71	752.75	894.00	14312
% Female Physicians	0.238	0.32	0.00	0.00	1.00	1.00	14312
% Group Physicians	0.156	0.22	0.00	0.00	0.82	0.96	14312
Independent Demographic Variables from Primary Care Service Areas							
Mean HH Income	56035.089	19418.59	15691.20	27538.20	121675.89	196972.35	14312
Percent College Grad	11.199	5.18	1.28	3.12	26.14	35.67	14312
Percent High School Grad	20.045	6.28	2.87	6.17	34.78	45.29	14312
Dependent Utilization Variables Constructed from Following Two Years of Claims							
Had Part B Visit	0.960	0.20	0.00	0.00	1.00	1.00	14312
Part B Charges	13378.061	23517.60	0.00	0.00	106663.08	750594.56	14312
Part B Procedures	80.437	88.01	0.00	0.00	432.00	1184.00	14312
Days Submitted Part B Claim	27.967	25.53	0.00	0.00	121.00	310.00	14312
Part B Allowed Amounts	4724.658	8195.05	0.00	0.00	34633.22	251958.59	14312
Part B Denied Charges	1168.746	3767.96	0.00	0.00	14771.19	150322.67	14312
Part B Allowed Procedures	71.752	80.02	0.00	0.00	390.00	1119.00	14312
Part B Denied Procedures	8.685	16.42	0.00	0.00	72.00	559.00	14312
Had Emergency Department Visit	0.304	0.46	0.00	0.00	1.00	1.00	14312
Emergency Department Charges	566.641	1848.45	0.00	0.00	7584.00	77982.42	14312

Table A.2: Females: Submitted Part B Charges in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.521***	.504***	-.006	-.022
	(.041)	(.041)	(.038)	(.038)
Black Beneficiary	.	-.125	-.069	-.104
		(.076)	(.068)	(.071)
Non-White & Non-Black Beneficiary	.	-.273***	-.099	-.106
		(.092)	(.084)	(.088)
Dual Eligible	.	.318***	.048	.042
		(.069)	(.063)	(.063)
Log(Mean Household Income)	.	.340***	.306***	.289***
		(.093)	(.079)	(.088)
Percent College Grad	.	-.004	-.012**	-.002
		(.006)	(.005)	(.005)
Percent High School Grad	.	-.015***	-.020***	-.007
		(.004)	(.004)	(.004)
Charlson Index	.	.	.008	.008
			(.007)	(.007)
Log(Part B Charges First Six Months)	.	.	-.216***	-.225***
			(.038)	(.038)
Log(Days with Part B Claim First Six Months)	.	.	.268***	.286***
			(.051)	(.051)
Log(Part B Procedures First Six Months)	.	.	.103**	.096*
			(.051)	(.051)
Log(Part B Allowed Amounts First Six Months)	.	.	.493***	.489***
			(.028)	(.028)
Log(Part B Denied Charges First Six Months)	.	.	-.008	-.008
			(.007)	(.007)
Log(Inpatient Charges)	.	.	.045***	.045***
			(.010)	(.010)
Log(Outpatient Charges)	.	.	.097***	.099***
			(.004)	(.004)
Log(Emergency Department Charges)	.	.	-.125***	-.125***
			(.012)	(.012)
Average Experience of Physicians in First Six Months	.	.	.0004***	.0005***
			(.0001)	(.0001)
% Female Physicians First Six Months	.	.	.095*	.120**
			(.057)	(.057)
% Group Physicians First Six Months	.	.	.123	.103
			(.104)	(.105)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.008	.016	.268	.279

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total submitted Part B charges for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.3: Females: Part B Procedures in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.387***	.377***	-.009	-.016
	(.025)	(.025)	(.022)	(.022)
Black Beneficiary	.	-.083*	-.039	-.073*
		(.044)	(.037)	(.038)
Non-White & Non-Black Beneficiary	.	-.192***	-.072	-.076
		(.056)	(.048)	(.050)
Dual Eligible	.	.213***	.053	.049
		(.041)	(.035)	(.035)
Log(Mean Household Income)	.	.192***	.171***	.175***
		(.058)	(.046)	(.051)
Percent College Grad	.	-.001	-.005*	-.00005
		(.004)	(.003)	(.003)
Percent High School Grad	.	-.008***	-.011***	-.003
		(.003)	(.002)	(.002)
Charlson Index	.	.	.013***	.013***
			(.004)	(.004)
Log(Part B Charges First Six Months)	.	.	-.217***	-.217***
			(.020)	(.020)
Log(Days with Part B Claim First Six Months)	.	.	.191***	.205***
			(.028)	(.028)
Log(Part B Procedures First Six Months)	.	.	.260***	.247***
			(.027)	(.027)
Log(Part B Allowed Amounts First Six Months)	.	.	.250***	.247***
			(.013)	(.013)
Log(Part B Denied Charges First Six Months)	.	.	-.011***	-.011***
			(.004)	(.004)
Log(Inpatient Charges)	.	.	.024***	.024***
			(.006)	(.006)
Log(Outpatient Charges)	.	.	.054***	.056***
			(.003)	(.003)
Log(Emergency Department Charges)	.	.	-.075***	-.075***
			(.007)	(.007)
Average Experience of Physicians in First Six Months	.	.	.0002***	.0002***
			(.00008)	(.00008)
% Female Physicians First Six Months	.	.	.036	.052*
			(.031)	(.031)
% Group Physicians First Six Months	.	.	.019	.012
			(.059)	(.059)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.014	.021	.339	.349

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of Part B procedures for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.4: Females: Days with a Part B Claim in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.307***	.302***	-.004	-.007
	(.021)	(.021)	(.018)	(.018)
Black Beneficiary	.	-.104***	-.055*	-.079***
		(.035)	(.029)	(.030)
Non-White & Non-Black Beneficiary	.	-.182***	-.061	-.072*
		(.045)	(.038)	(.039)
Dual Eligible	.	.197***	.043	.041
		(.033)	(.028)	(.028)
Log(Mean Household Income)	.	.147***	.138***	.122***
		(.046)	(.036)	(.040)
Percent College Grad	.	.0007	-.003	-.0005
		(.003)	(.002)	(.002)
Percent High School Grad	.	-.003	-.006***	-.002
		(.002)	(.002)	(.002)
Charlson Index	.	.	.011***	.011***
			(.003)	(.003)
Log(Part B Charges First Six Months)	.	.	-.177***	-.177***
			(.016)	(.016)
Log(Days with Part B Claim First Six Months)	.	.	.366***	.370***
			(.022)	(.022)
Log(Part B Procedures First Six Months)	.	.	.062***	.059***
			(.021)	(.021)
Log(Part B Allowed Amounts First Six Months)	.	.	.192***	.190***
			(.010)	(.010)
Log(Part B Denied Charges First Six Months)	.	.	-.006**	-.006**
			(.003)	(.003)
Log(Inpatient Charges)	.	.	.023***	.024***
			(.005)	(.005)
Log(Outpatient Charges)	.	.	.050***	.051***
			(.002)	(.002)
Log(Emergency Department Charges)	.	.	-.065***	-.065***
			(.006)	(.006)
Average Experience of Physicians in First Six Months	.	.	.0002***	.0002***
			(.00006)	(.00006)
% Female Physicians First Six Months	.	.	.043*	.052**
			(.025)	(.025)
% Group Physicians First Six Months	.	.	.020	.011
			(.047)	(.048)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.013	.02	.366	.373

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of days that the beneficiary submitted Part B procedures in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.5: Females: Probability of Part B Visit in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.026***	.025***	-.0004	.0002
	(.003)	(.003)	(.003)	(.003)
Black Beneficiary	.	-.014*	-.008	-.009
		(.007)	(.007)	(.007)
Non-White & Non-Black Beneficiary	.	-.007	-.002	-.001
		(.008)	(.008)	(.009)
Dual Eligible	.	.002	-.008	-.007
		(.006)	(.006)	(.006)
Log(Mean Household Income)	.	.004	.003	.003
		(.007)	(.007)	(.008)
Percent College Grad	.	.0002	-.0003	.0003
		(.0005)	(.0005)	(.0005)
Percent High School Grad	.	-.0004	-.0009***	.0001
		(.0004)	(.0003)	(.0004)
Charlson Index	.	.	-.002**	-.001**
			(.0007)	(.0007)
Log(Part B Charges First Six Months)	.	.	-.034***	-.035***
			(.004)	(.004)
Log(Days with Part B Claim First Six Months)	.	.	.014***	.016***
			(.005)	(.005)
Log(Part B Procedures First Six Months)	.	.	.006	.005
			(.005)	(.005)
Log(Part B Allowed Amounts First Six Months)	.	.	.047***	.047***
			(.003)	(.003)
Log(Part B Denied Charges First Six Months)	.	.	-.0004	-.0003
			(.0006)	(.0006)
Log(Inpatient Charges)	.	.	.0005	.0004
			(.0008)	(.0008)
Log(Outpatient Charges)	.	.	.003***	.003***
			(.0003)	(.0003)
Log(Emergency Department Charges)	.	.	-.005***	-.005***
			(.001)	(.001)
Average Experience of Physicians in First Six Months	.	.	.00003**	.00004***
			(1.00e-05)	(1.00e-05)
% Female Physicians First Six Months	.	.	.013**	.014**
			(.006)	(.006)
% Group Physicians First Six Months	.	.	.017*	.020**
			(.010)	(.010)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.003	.004	.131	.143

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is a binary indicator of whether the beneficiary had a Part B visit in the two years following the initial six months of enrollment, making this a linear probability model. Columns 1 through 4 account for an increasing number of control variables.

Table A.6: Females: Denied Part B Charges in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.646***	.582***	.043	.028
	(.055)	(.054)	(.055)	(.055)
Black Beneficiary	.	-.076	-.011	.014
		(.095)	(.091)	(.093)
Non-White & Non-Black Beneficiary	.	-.067	.096	.021
		(.113)	(.109)	(.113)
Dual Eligible	.	.153*	.002	-.041
		(.081)	(.079)	(.079)
Log(Mean Household Income)	.	.665***	.598***	.430***
		(.122)	(.114)	(.124)
Percent College Grad	.	-.018**	-.021***	.001
		(.008)	(.007)	(.008)
Percent High School Grad	.	-.052***	-.050***	-.023***
		(.005)	(.005)	(.006)
Charlson Index	.	.	.0009	-.002
			(.011)	(.011)
Log(Part B Charges First Six Months)	.	.	.043	.018
			(.044)	(.045)
Log(Days with Part B Claim First Six Months)	.	.	.289***	.307***
			(.067)	(.067)
Log(Part B Procedures First Six Months)	.	.	.135**	.150**
			(.061)	(.061)
Log(Part B Allowed Amounts First Six Months)	.	.	.071***	.066**
			(.026)	(.026)
Log(Part B Denied Charges First Six Months)	.	.	.079***	.074***
			(.010)	(.010)
Log(Inpatient Charges)	.	.	.044***	.044***
			(.014)	(.014)
Log(Outpatient Charges)	.	.	.071***	.073***
			(.008)	(.008)
Log(Emergency Department Charges)	.	.	-.091***	-.093***
			(.017)	(.017)
Average Experience of Physicians in First Six Months	.	.	.0002	.0003*
			(.0002)	(.0002)
% Female Physicians First Six Months	.	.	.122*	.148**
			(.071)	(.071)
% Group Physicians First Six Months	.	.	-.053	-.140
			(.144)	(.143)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.008	.031	.132	.146

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total denied Part B charges for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.7: Females: Allowed Part B Amounts in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.589***	.573***	.015	-.008
	(.043)	(.043)	(.037)	(.037)
Black Beneficiary	.	-.223***	-.146**	-.198***
		(.080)	(.069)	(.071)
Non-White & Non-Black Beneficiary	.	-.246**	-.079	-.100
		(.099)	(.087)	(.092)
Dual Eligible	.	.300***	.008	.007
		(.073)	(.063)	(.064)
Log(Mean Household Income)	.	.296***	.269***	.260***
		(.100)	(.079)	(.090)
Percent College Grad	.	.006	-.005	.0009
		(.006)	(.005)	(.005)
Percent High School Grad	.	-.003	-.012***	-.002
		(.004)	(.003)	(.004)
Charlson Index	.	.	.009	.009
			(.007)	(.007)
Log(Part B Charges First Six Months)	.	.	-.463***	-.462***
			(.038)	(.038)
Log(Days with Part B Claim First Six Months)	.	.	.216***	.226***
			(.051)	(.051)
Log(Part B Procedures First Six Months)	.	.	.117**	.107**
			(.049)	(.049)
Log(Part B Allowed Amounts First Six Months)	.	.	.781***	.776***
			(.027)	(.027)
Log(Part B Denied Charges First Six Months)	.	.	-.008	-.008
			(.007)	(.007)
Log(Inpatient Charges)	.	.	.032***	.033***
			(.010)	(.010)
Log(Outpatient Charges)	.	.	.097***	.099***
			(.004)	(.004)
Log(Emergency Department Charges)	.	.	-.126***	-.126***
			(.012)	(.012)
Average Experience of Physicians in First Six Months	.	.	.0005***	.0005***
			(.0001)	(.0001)
% Female Physicians First Six Months	.	.	.071	.093*
			(.056)	(.056)
% Group Physicians First Six Months	.	.	.090	.072
			(.104)	(.105)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.01	.015	.36	.368

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total allowed Part B amounts for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.8: Females: Part B Denied Procedures in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.308***	.285***	.036	.027
	(.024)	(.024)	(.024)	(.023)
Black Beneficiary	.	-.002	.028	.032
		(.038)	(.035)	(.035)
Non-White & Non-Black Beneficiary	.	-.076*	.002	-.022
		(.045)	(.042)	(.043)
Dual Eligible	.	.076**	.018	.003
		(.032)	(.031)	(.031)
Log(Mean Household Income)	.	.277***	.250***	.193***
		(.052)	(.048)	(.052)
Percent College Grad	.	-.009***	-.010***	-.0007
		(.003)	(.003)	(.003)
Percent High School Grad	.	-.019***	-.019***	-.007***
		(.002)	(.002)	(.002)
Charlson Index	.	.	.004	.002
			(.004)	(.004)
Log(Part B Charges First Six Months)	.	.	-.038**	-.044**
			(.017)	(.017)
Log(Days with Part B Claim First Six Months)	.	.	.108***	.118***
			(.027)	(.027)
Log(Part B Procedures First Six Months)	.	.	.137***	.137***
			(.024)	(.024)
Log(Part B Allowed Amounts First Six Months)	.	.	.021**	.018*
			(.010)	(.010)
Log(Part B Denied Charges First Six Months)	.	.	.038***	.036***
			(.004)	(.004)
Log(Inpatient Charges)	.	.	.013**	.012**
			(.006)	(.006)
Log(Outpatient Charges)	.	.	.027***	.028***
			(.003)	(.003)
Log(Emergency Department Charges)	.	.	-.033***	-.033***
			(.007)	(.007)
Average Experience of Physicians in First Six Months	.	.	.0001	.0001*
			(.00007)	(.00007)
% Female Physicians First Six Months	.	.	.049*	.061**
			(.028)	(.028)
% Group Physicians First Six Months	.	.	-.152***	-.186***
			(.058)	(.058)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.012	.031	.159	.175

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of denied Part B procedures for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.9: Females: Part B Allowed Procedures in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	.408***	.399***	-.008	-.017
	(.027)	(.027)	(.023)	(.023)
Black Beneficiary	.	-.129***	-.080**	-.123***
		(.048)	(.039)	(.041)
Non-White & Non-Black Beneficiary	.	-.209***	-.084	-.083
		(.061)	(.052)	(.054)
Dual Eligible	.	.218***	.039	.039
		(.044)	(.037)	(.037)
Log(Mean Household Income)	.	.168***	.152***	.174***
		(.062)	(.048)	(.054)
Percent College Grad	.	.003	-.003	.00005
		(.004)	(.003)	(.003)
Percent High School Grad	.	-.004	-.008***	-.003
		(.003)	(.002)	(.002)
Charlson Index	.	.	.013***	.013***
			(.004)	(.004)
Log(Part B Charges First Six Months)	.	.	-.284***	-.283***
			(.021)	(.021)
Log(Days with Part B Claim First Six Months)	.	.	.167***	.181***
			(.029)	(.029)
Log(Part B Procedures First Six Months)	.	.	.262***	.246***
			(.028)	(.028)
Log(Part B Allowed Amounts First Six Months)	.	.	.349***	.346***
			(.014)	(.014)
Log(Part B Denied Charges First Six Months)	.	.	-.018***	-.018***
			(.004)	(.004)
Log(Inpatient Charges)	.	.	.024***	.025***
			(.006)	(.006)
Log(Outpatient Charges)	.	.	.059***	.061***
			(.003)	(.003)
Log(Emergency Department Charges)	.	.	-.080***	-.080***
			(.007)	(.007)
Average Experience of Physicians in First Six Months	.	.	.0003***	.0003***
			(.00008)	(.00008)
% Female Physicians First Six Months	.	.	.030	.046
			(.032)	(.032)
% Group Physicians First Six Months	.	.	.029	.029
			(.061)	(.061)
Coverage Start Month Dummies	N	Y	Y	Y
Physician Specialty Mix	N	N	Y	Y
State FEs	N	N	N	Y
Obs.	14312	14312	14312	14312
R^2	.013	.019	.372	.38

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome is the natural logarithm of the total number of allowed Part B procedures for the beneficiary in the two years following the initial six months of enrollment. Columns 1 through 4 account for an increasing number of control variables.

Table A.10: Females: Heterogeneity in Results by Income

	(1)	(2)	(3)	(4)	(5)	(6)
Saw ABN in First Six Months	.978	-.749	2.246*	1.113	-.032	1.661**
	(1.161)	(1.702)	(1.148)	(.701)	(.758)	(.720)
Saw ABN × log(Median HH Income)	-.092	.071	-.206*	-.103	.005	-.154**
	(.107)	(.155)	(.106)	(.064)	(.069)	(.066)
Black Beneficiary	-.104	.014	-.196***	-.073*	.032	-.121***
	(.071)	(.093)	(.071)	(.038)	(.035)	(.041)
Non-White & Non-Black Beneficiary	-.107	.022	-.101	-.077	-.022	-.085
	(.088)	(.113)	(.092)	(.050)	(.043)	(.054)
Dual Eligible	.043	-.042	.008	.049	.003	.040
	(.063)	(.079)	(.064)	(.035)	(.031)	(.037)
Log(Mean Household Income)	.304***	.419***	.294***	.192***	.192***	.199***
	(.092)	(.128)	(.093)	(.052)	(.053)	(.056)
Percent College Grad	-.002	.001	.001	1.17e-06	-.0007	.0001
	(.005)	(.008)	(.005)	(.003)	(.003)	(.003)
Percent High School Grad	-.007*	-.023***	-.002	-.003	-.007***	-.003
	(.004)	(.006)	(.004)	(.002)	(.002)	(.002)
Charlson Index	.008	-.002	.009	.013***	.002	.013***
	(.007)	(.011)	(.007)	(.004)	(.004)	(.004)
Log(Part B Charges First Six Months)	-.226***	.019	-.463***	-.217***	-.044**	-.283***
	(.038)	(.045)	(.038)	(.020)	(.017)	(.021)
Log(Days with Part B Claim First Six Months)	.286***	.307***	.227***	.206***	.118***	.181***
	(.051)	(.067)	(.051)	(.028)	(.027)	(.029)
Log(Part B Procedures First Six Months)	.096*	.150**	.107**	.247***	.137***	.246***
	(.051)	(.061)	(.049)	(.027)	(.024)	(.028)
Log(Part B Allowed Amounts First Six Months)	.489***	.066**	.776***	.247***	.018*	.346***
	(.028)	(.026)	(.027)	(.013)	(.010)	(.014)
Log(Part B Denied Charges First Six Months)	-.008	.074***	-.008	-.011***	.036***	-.018***
	(.007)	(.010)	(.007)	(.004)	(.004)	(.004)
Log(Inpatient Charges)	.045***	.044***	.033***	.024***	.012**	.025***
	(.010)	(.014)	(.010)	(.006)	(.006)	(.006)
Log(Outpatient Charges)	.099***	.073***	.100***	.056***	.028***	.061***
	(.004)	(.008)	(.004)	(.003)	(.003)	(.003)
Log(Emergency Department Charges)	-.125***	-.093***	-.126***	-.075***	-.033***	-.080***
	(.012)	(.017)	(.012)	(.007)	(.007)	(.007)
Average Experience of Physicians in First Six Months	.0005***	.0003*	.0005***	.0002***	.0001*	.0003***
	(.0001)	(.0002)	(.0001)	(.00008)	(.00007)	(.00008)
% Female Physicians First Six Months	.120**	.148**	.093*	.052*	.061**	.047
	(.057)	(.071)	(.056)	(.031)	(.028)	(.032)
% Group Physicians First Six Months	.105	-.141	.075	.014	-.186***	.032
	(.105)	(.143)	(.105)	(.059)	(.058)	(.061)
Coverage Start Month Dummies	Y	Y	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y	Y	Y
State FEs	Y	Y	Y	Y	Y	Y
Obs.	14312	14312	14312	14312	14312	14312
R^2	.279	.146	.368	.349	.175	.38

*10%, **5%, ***1% significance

This table presents the results of equation 3.2 with the interaction variable of interest, D_m, being the median household income in the primary care service area of the beneficiary. The outcomes of columns 1-3 are log(total charges), log(denied charges), and log(allowed charges) for the following two years, respectively. The outcomes of columns 4-6 are log(total procedures), log(denied procedures), and log(allowed procedures) for the following two years respectively.

Table A.11: Females: Heterogeneity in Results by Education

	(1)	(2)	(3)	(4)	(5)	(6)
Saw ABN in First Six Months	.043	.048	.095	.035	.063	.050
	(.084)	(.129)	(.081)	(.050)	(.057)	(.052)
Saw ABN × Percent College Grad	-.006	-.002	-.009	-.004	-.003	-.006
	(.006)	(.009)	(.006)	(.004)	(.004)	(.004)
Black Beneficiary	-.104	.015	-.197***	-.073*	.033	-.122***
	(.071)	(.093)	(.071)	(.038)	(.035)	(.041)
Non-White & Non-Black Beneficiary	-.107	.021	-.101	-.076	-.023	-.084
	(.088)	(.113)	(.092)	(.050)	(.043)	(.054)
Dual Eligible	.042	-.041	.008	.049	.004	.039
	(.063)	(.079)	(.064)	(.035)	(.031)	(.037)
Log(Mean Household Income)	.288***	.430***	.259***	.175***	.193***	.173***
	(.088)	(.124)	(.089)	(.051)	(.052)	(.054)
Percent College Grad	-.0008	.001	.003	.0008	-.00007	.001
	(.006)	(.008)	(.006)	(.003)	(.003)	(.003)
Percent High School Grad	-.007	-.023***	-.002	-.003	-.007***	-.003
	(.004)	(.006)	(.004)	(.002)	(.002)	(.002)
Charlson Index	.008	-.002	.009	.013***	.002	.013***
	(.007)	(.011)	(.007)	(.004)	(.004)	(.004)
Log(Part B Charges First Six Months)	-.226***	.018	-.463***	-.217***	-.044**	-.283***
	(.038)	(.045)	(.038)	(.020)	(.017)	(.021)
Log(Days with Part B Claim First Six Months)	.286***	.307***	.227***	.205***	.118***	.181***
	(.051)	(.067)	(.051)	(.028)	(.027)	(.029)
Log(Part B Procedures First Six Months)	.096*	.150**	.107**	.247***	.137***	.246***
	(.051)	(.061)	(.049)	(.027)	(.024)	(.028)
Log(Part B Allowed Amounts First Six Months)	.489***	.066**	.776***	.247***	.018*	.346***
	(.028)	(.026)	(.027)	(.013)	(.010)	(.014)
Log(Part B Denied Charges First Six Months)	-.008	.074***	-.008	-.011***	.036***	-.018***
	(.007)	(.010)	(.007)	(.004)	(.004)	(.004)
Log(Inpatient Charges)	.045***	.044***	.033***	.024***	.012**	.025***
	(.010)	(.014)	(.010)	(.006)	(.006)	(.006)
Log(Outpatient Charges)	.099***	.073***	.100***	.056***	.028***	.061***
	(.004)	(.008)	(.004)	(.003)	(.003)	(.003)
Log(Emergency Department Charges)	-.125***	-.093***	-.126***	-.075***	-.033***	-.080***
	(.012)	(.017)	(.012)	(.007)	(.007)	(.007)
Average Experience of Physicians in First Six Months	.0005***	.0003*	.0005***	.0002***	.0001*	.0003***
	(.0001)	(.0002)	(.0001)	(.00008)	(.00007)	(.00008)
% Female Physicians First Six Months	.120**	.148**	.093*	.052*	.061**	.046
	(.057)	(.071)	(.056)	(.031)	(.028)	(.032)
% Group Physicians First Six Months	.103	-.140	.072	.012	-.185***	.029
	(.105)	(.143)	(.105)	(.059)	(.058)	(.061)
Coverage Start Month Dummies	Y	Y	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y	Y	Y
State FEs	Y	Y	Y	Y	Y	Y
Obs.	14312	14312	14312	14312	14312	14312
R^2	.279	.146	.368	.349	.175	.38

*10%, **5%, ***1% significance

This table presents the results of equation 3.2 with the interaction variable of interest, D_m, being the percent of individuals that are college graduates in the primary care service area of the beneficiary. The outcomes of columns 1-3 are log(total charges), log(denied charges), and log(allowed charges) for the following two years, respectively. The outcomes of columns 4-6 are log(total procedures), log(denied procedures), and log(allowed procedures) for the following two years respectively.

Table A.12: Females: Emergency Department Utilization in Following Two Years

	(1)	(2))
Saw ABN in First Six Months	-.006	-.058
	(.009)	(.061)
Black Beneficiary	.051***	.387***
	(.013)	(.094)
Non-White & Non-Black Beneficiary	-.033**	-.300**
	(.017)	(.122)
Dual Eligible	.100***	.831***
	(.013)	(.092)
Log(Mean Household Income)	.030*	.255**
	(.017)	(.125)
Percent College Grad	-.002	-.013
	(.001)	(.008)
Percent High School Grad	-.0005	-.008
	(.0008)	(.006)
Charlson Index	.002	.021*
	(.002)	(.012)
Log(Part B Charges First Six Months)	-.011*	-.071*
	(.006)	(.042)
Log(Days with Part B Claim First Six Months)	.015	.135**
	(.010)	(.067)
Log(Part B Procedures First Six Months)	.014	.098
	(.009)	(.062)
Log(Part B Allowed Amounts First Six Months)	.003	.018
	(.003)	(.022)
Log(Part B Denied Charges First Six Months)	.0008	.003
	(.001)	(.010)
Log(Inpatient Charges)	.049***	.377***
	(.002)	(.017)
Log(Outpatient Charges)	.091***	.624***
	(.001)	(.008)
Log(Emergency Department Charges)	-.073***	-.499***
	(.003)	(.021)
Average Experience of Physicians in First Six Months	1.00e-05	.0001
	(.00002)	(.0002)
% Female Physicians First Six Months	.002	.024
	(.010)	(.072)
% Group Physicians First Six Months	.051**	.333**
	(.023)	(.159)
Coverage Start Month Dummies	Y	Y
Physician Specialty Mix	Y	Y
State FEs	Y	Y
Obs.	14312	14312
R^2	.366	.367

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 where the outcome of column 1 is a binary indicator of whether the beneficiary had an emergency department (ED) visit in the two years following the initial six months of enrollment. The outcome of column 2 is the natural logarithm of the total ED charges submitted in those same two years.

Table A.13: Females: Heterogeneous Associations with ED Visits in Following Two Years

	(1)	(2)	(3)	(4)
Saw ABN in First Six Months	-.310	-.012	-2.437	-.092
	(.267)	(.019)	(1.882)	(.133)
Saw ABN × log(Median HH Income)	.028	.	.218	.
	(.024)		(.173)	
Saw ABN × Percent College Grad	.	.0005	.	.003
		(.001)		(.010)
Black Beneficiary	.051***	.051***	.385***	.387***
	(.013)	(.013)	(.094)	(.094)
Non-White & Non-Black Beneficiary	-.033*	-.033*	-.299**	-.300**
	(.017)	(.017)	(.122)	(.122)
Dual Eligible	.100***	.100***	.829***	.831***
	(.013)	(.013)	(.092)	(.092)
Log(Mean Household Income)	.025	.030*	.219*	.255**
	(.018)	(.017)	(.129)	(.125)
Percent College Grad	-.002	-.002	-.013	-.013
	(.001)	(.001)	(.008)	(.008)
Percent High School Grad	-.0004	-.0005	-.008	-.008
	(.0008)	(.0008)	(.006)	(.006)
Charlson Index	.002	.002	.021*	.021*
	(.002)	(.002)	(.012)	(.012)
Log(Part B Charges First Six Months)	-.011*	-.011*	-.070*	-.071*
	(.006)	(.006)	(.042)	(.042)
Log(Days with Part B Claim First Six Months)	.015	.015	.135**	.135**
	(.010)	(.010)	(.067)	(.067)
Log(Part B Procedures First Six Months)	.014	.014	.098	.098
	(.009)	(.009)	(.062)	(.062)
Log(Part B Allowed Amounts First Six Months)	.003	.003	.018	.018
	(.003)	(.003)	(.022)	(.022)
Log(Part B Denied Charges First Six Months)	.0008	.0008	.003	.003
	(.001)	(.001)	(.010)	(.010)
Log(Inpatient Charges)	.049***	.049***	.377***	.377***
	(.002)	(.002)	(.017)	(.017)
Log(Outpatient Charges)	.091***	.091***	.624***	.624***
	(.001)	(.001)	(.008)	(.008)
Log(Emergency Department Charges)	-.073***	-.073***	-.499***	-.499***
	(.003)	(.003)	(.021)	(.021)
Average Experience of Physicians in First Six Months	1.00e-05	1.00e-05	.0001	.0001
	(.00002)	(.00002)	(.0002)	(.0002)
% Female Physicians First Six Months	.002	.002	.024	.024
	(.010)	(.010)	(.072)	(.072)
% Group Physicians First Six Months	.051**	.051**	.330**	.333**
	(.023)	(.023)	(.159)	(.159)
Coverage Start Month Dummies	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y
State FEs	Y	Y	Y	Y
Obs.	14312	14312	14312	14312
R^2	.366	.366	.367	.367

*10%, **5%, ***1% significance

This table presents the results of equation 3.2 where the outcomes are a binary indicator of whether the beneficiary had an ED visit (columns 1 and 2) and the log(total ED charges) (columns 3 and 4) in the two years following the initial six months of enrollment. Column 1 and 3 present heterogeneity with respect to income and columns 2 and 4 present heterogeneity with respect to education level.

Table A.14: Females: Associations for Experienced Beneficiaries

	(1)	(2)	(3)	(4)	(5)	(6)
Saw ABN in First Six Months	-.028	.029	-.003	-.0009	.013	.002
	(.030)	(.053)	(.030)	(.019)	(.022)	(.020)
Black Beneficiary	-.217***	-.066	-.308***	-.164***	-.027	-.215***
	(.055)	(.085)	(.057)	(.033)	(.034)	(.035)
Non-White & Non-Black Beneficiary	-.186**	-.290**	-.250***	-.155***	-.144***	-.180***
	(.076)	(.115)	(.077)	(.042)	(.048)	(.044)
Dual Eligible	.072	.067	.025	.097***	.083***	.066**
	(.046)	(.072)	(.045)	(.027)	(.029)	(.027)
Log(Mean Household Income)	.181**	.486***	.188**	.120**	.197***	.124**
	(.081)	(.120)	(.082)	(.049)	(.050)	(.052)
Percent College Grad	-.008	-.010	-.006	-.004	-.004	-.005
	(.005)	(.007)	(.005)	(.003)	(.003)	(.003)
Percent High School Grad	-.009***	-.024***	-.006*	-.006***	-.010***	-.005**
	(.004)	(.006)	(.003)	(.002)	(.002)	(.002)
Charlson Index	.022***	.019**	.020***	.019***	.010***	.019***
	(.005)	(.009)	(.005)	(.003)	(.004)	(.003)
Log(Part B Charges First Six Months)	-.224***	.008	-.566***	-.254***	-.045**	-.358***
	(.034)	(.044)	(.032)	(.018)	(.017)	(.018)
Log(Days with Part B Claim First Six Months)	.127***	.306***	.065	.130***	.075***	.102***
	(.044)	(.063)	(.044)	(.025)	(.025)	(.027)
Log(Part B Procedures First Six Months)	.168***	.243***	.141***	.325***	.234***	.303***
	(.043)	(.060)	(.041)	(.024)	(.024)	(.025)
Log(Part B Allowed Amounts First Six Months)	.487***	-.015	.942***	.266***	-.017	.427***
	(.031)	(.031)	(.030)	(.014)	(.012)	(.014)
Log(Part B Denied Charges First Six Months)	-.014**	.095***	-.012**	-.012***	.038***	-.018***
	(.005)	(.009)	(.006)	(.003)	(.004)	(.004)
Log(Inpatient Charges)	.030***	.038***	.024***	.020***	.017***	.018***
	(.006)	(.011)	(.006)	(.004)	(.005)	(.004)
Log(Outpatient Charges)	.076***	.064***	.076***	.046***	.024***	.050***
	(.003)	(.007)	(.003)	(.002)	(.003)	(.002)
Log(Emergency Department Charges)	-.079***	-.084***	-.080***	-.056***	-.035***	-.059***
	(.008)	(.015)	(.008)	(.005)	(.006)	(.006)
Average Experience of Physicians in First Six Months	.0002**	.0005***	.0003***	.0002***	.0002***	.0002***
	(.0001)	(.0002)	(.0001)	(.00006)	(.00007)	(.00007)
% Female Physicians First Six Months	.049	.087	.076	.019	.029	.035
	(.051)	(.073)	(.050)	(.029)	(.028)	(.030)
% Group Physicians First Six Months	.290***	.128	.333***	.120**	-.059	.169***
	(.086)	(.135)	(.089)	(.052)	(.056)	(.055)
Coverage Start Month Dummies	Y	Y	Y	Y	Y	Y
Physician Specialty Mix	Y	Y	Y	Y	Y	Y
State FEs	Y	Y	Y	Y	Y	Y
Obs.	15205	15205	15205	15205	15205	15205
R^2	.306	.161	.427	.397	.203	.436

*10%, **5%, ***1% significance

This table presents the results of equation 3.1 when only beneficiaries who enrolled in the first six months of 2002 are considered. The outcomes of columns 1-3 are log(total charges), log(denied charges), and log(allowed charges) for the following two years, respectively. The outcomes of columns 4-6 are log(total procedures), log(denied procedures), and log(allowed procedures) for the following two years respectively.

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Curriculum Vitae

Sohini Mahapatra received a B.S. in economics and mathematics with high honors and highest distinction from the University of Michigan in 2009. She joined the Ph.D. program in economics at Johns Hopkins University in 2011. During graduate school, she received the Bruce Hamilton Research Seminar Award and the Professor Joel Dean Undergraduate Teaching Award. Her research interest is health economics with a focus on how patients and physicians navigate the complex payment system.

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